FLUENSULFONE (265)

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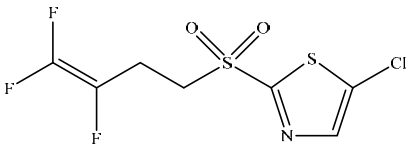
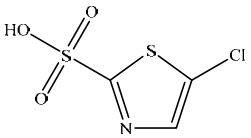
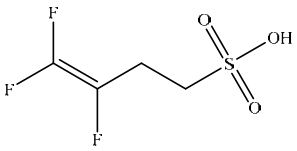
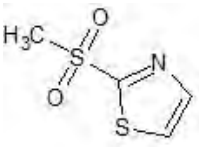
EXPLANATION

Fluensulfone is a non-fumigant nematicide containing sulfone, thiazolyl and fluoroalkenyl functional groups.

Fluensulfone was evaluated by JMPR for the first time for toxicology in 2013, when an ADI of 0-0.01 mg/kg bw/day and an ARfD of 0.3 mg/kg bw were established, and for residues in 2014. A residue definition of *3,4,4-trifluorobut-3-ene-1-sulfonic acid (BSA)* was recommended for plant commodities, for compliance with MRLs and for dietary risk assessment. A residue definition for animal commodities was not considered necessary, given that few matrices in the animal metabolism studies contained any finite residues of fluensulfone-specific compounds, and finite residues of the parent compound were not expected to be found in plants.

At the 47th Session of the CCPR (2015), fluensulfone was scheduled for evaluation of additional use patterns by the 2016 JMPR.

The Meeting received residue data for strawberries, brassica vegetables (cabbage and cauliflower), fruiting vegetables, cucurbits (cucumber, summer squash and melon), fruiting vegetables other than cucurbits (tomato and capsicum), leafy vegetables (head and leaf lettuce, spinach, radish leaves, mustard greens, Japanese mustard spinach, and hot herb mustard), root and tuber vegetables (potato, carrot, radish, turnip and Japanese white radish), and celery. Other data provided included a field rotational cropping study, processing data for potatoes, storage stability data for oranges, and product labels/GAP information from the USA.

Common name/abbreviation	Chemical name	Structure	Molecular weight
Fluensulfone, MCW-2	5-Chloro-2-[(3,4,4-trifluorobut-3-en-1-yl)sulfonyl]thiazole		291.7
Thiazole sulfonic acid, TSA, M-3625	5-Chloro-thiazole-2-sulfonic acid		199.6
Butene sulfonic acid, BSA, M-3627	3,4,4-Trifluorobut-3-ene-1-sulfonic acid		190.1
MeS, M-3626	2-Methylsulfonylthiazole		131.2

Field rotational crop studies

Field rotational crop residue studies were conducted at three US sites (Jones, 2015-a). A single pre-planting incorporation application was made to bare soil at each site at a target rate of 4.0 kg ai/ha using a 480 g/L EC formulation of fluensulfone. The treated plot and an untreated control area at each

site were subdivided into six subplots according to plant back interval, with each of the subplots being further subdivided into 1–4 areas for planting of individual crops.

Following crops (lettuce, radish, green beans, and wheat) were sown at the following target plant back intervals: 30, 60, 120, 180, 270 and 365 days after application. Only wheat was planted at the Georgia site.

Single samples were collected from the untreated control plots and the treated plots. Some crops failed and therefore samples were not collected from all sites, planting intervals and crops.

Samples were analysed for residues of fluensulfone and the metabolites TSA and BSA using an LC-MS/MS method essentially the same as the key method evaluated by the 2014 JMPR (method number 1977W; involving extraction using acetonitrile/water, with two aliquots being taken, with the first being directly analysed in the positive ionisation mode for fluensulfone, and the second cleaned up by solid phase extraction (C18) prior to analysis in the negative ionisation mode for BSA and TSA). Suitable validation data was provided, with recoveries in the range 70–120%, and an LOQ of 0.01 mg/kg for each analyte. Treated samples of wheat grain, and control samples of wheat hay and straw from the 30, 60 and 120-day plant back intervals at the Athens, Georgia trial were not analysed until 32–34 months after sample collection, and these results (identified in Table 1) are not considered to be adequately supported by storage stability data and have been disregarded. All lettuce, radish leaf/root, green bean, and all other wheat matrices were analysed within 11, 12, 22, and 12 months of collection respectively.

Table 1 Residues of fluensulfone in field rotational crops

Location, Year, Trial Number	PBI, days	Crop (variety)	Application			Residues, mg/kg					
			No.	Rate, kg ai/ha	Spray volume (L/ha)	DAS	Matrix	Fluensulfone	TSA	BSA	Total [c]
Athens, GA, USA, AA110705-GA	31	Wheat (Georgia Gore #1122)	1	3.95	260	157	Forage	< 0.01	0.93	0.77	1.2
						160	Hay	< 0.01 (>LOD)[a]	2.2 [a]	1.0 [a]	1.5
						215	Grain	< 0.01 [b]	0.11 [b]	0.11 [b]	0.17
						215	Straw	< 0.01 [a]	0.34 [a]	0.52 [a]	0.80
	61	Wheat (Georgia Gore #1122)	1	4.02	220	157	Forage	< 0.01	1.6	0.81	1.2
						160	Hay	< 0.01 (>LOD) c< 0.01 (>LOD) [a]	4.1 [a]	1.4 [a]	2.2
						215	Grain	< 0.01 [b]	0.15 [b]	0.12 [b]	0.18
						215	Straw	< 0.01 (>LOD) [a]	0.43 [a]	0.44 [a]	0.68
	121	Wheat (Georgia Gore #1122)	1	4.03	210	157	Forage	< 0.01	1.3	0.10	0.15
						160	Hay	< 0.01 (>LOD) [a]	2.8 [a]	0.22 [a]	0.35
						215	Grain	< 0.01 [b]	0.08 [b]	0.02 [b]	0.03
						215	Straw	< 0.01 [a]	0.26 [a]	0.09 [a]	0.14
	176	Wheat (Georgia Gore #101)	1	4.04	280	182	Forage	< 0.01	0.52	< 0.01	< 0.015

Location, Year, Trial Number	PBI, days	Crop (variety)	Application			Residues, mg/kg					
			No.	Rate, kg ai/ha	Spray volume (L/ha)	DAS	Matrix	Fluensulfone	TSA	BSA	Total [c]
						184	Hay	< 0.01	1.3	0.08	0.12
						230	Grain	< 0.01	0.05	< 0.01	< 0.015
						230	Straw	< 0.01	0.48 c< 0.01 (>LOD)	< 0.01 (>LOD)	< 0.015
	268	Wheat (Georgia Gore #101)	1	4.04	270	182	Forage	< 0.01	0.45	0.04	0.06
						184	Hay	< 0.01	1.0	0.02	0.03
						230	Grain	< 0.01	0.07	0.01	0.015
						230	Straw	< 0.01	0.51 c< 0.01 (>LOD)	0.07	0.11
	365	Wheat (Georgia Gore #1205)	1	3.99	270	174	Forage	< 0.01	0.74	0.04	0.06
						177	Hay	< 0.01 (>LOD)	1.8	0.37	0.58
						239	Grain	< 0.01	0.08	< 0.01 (>LOD)	< 0.015
						239	Straw	< 0.01	0.33	0.02	0.03
Thonotosassa, FL, USA, AA110705-FL	31	Radish (Estella)	1	4.04	330	33	Leaves	< 0.01	2.1	0.19	0.29
						33	Roots	< 0.01	0.11	0.017	0.026
		Lettuce (Tango)	1	3.92	320	52	Leaves	< 0.01	0.014	< 0.01	< 0.015
		Beans (BB 2175)	1	3.86	320	60	Pods	< 0.01	0.35	0.04	0.06
	60	Radish (Estella)	1	3.85	320	33	Leaves	< 0.01	0.94	0.029	0.044
						33	Roots	< 0.01	0.03	< 0.01	< 0.015
		Lettuce (Tango)	1	3.83	310	52	Leaves	< 0.01	< 0.01 (>LOD)	< 0.01	< 0.015
		Beans (BB 2175)	1	3.95	330	60	Pods	< 0.01 c< 0.01 (>LOD)	0.20	< 0.01 (>LOD)	< 0.015
	120	Radish (Estella)	1	3.88	330	42	Leaves	< 0.01	0.22	0.41	0.63
						42	Roots	< 0.01	0.06	0.05	0.08
		Lettuce (Tango)	1	3.93	340	54	Leaves	< 0.01	0.014	< 0.01	< 0.015
		Beans (BB 2175)	1	3.85	330	56	Pods	< 0.01	0.16	0.03	0.05
	180	Radish	1	3.96	270	43	Leaves	< 0.01	0.15	< 0.01	< 0.015

Location, Year, Trial Number	PBI, days	Crop (variety)	Application			Residues, mg/kg					
			No.	Rate, kg ai/ha	Spray volume (L/ha)	DAS	Matrix	Fluensulfone	TSA	BSA	Total [c]
		(Estella)						c< 0.01 (>LOD)		(>LOD)	
						43	Roots	< 0.01	< 0.01	< 0.01	< 0.015
		Lettuce (Tango)	1	4.01	260	63	Leaves	< 0.01	0.01	< 0.01	< 0.015
		Beans (BB 2175)	1	3.90	270	71	Pods	< 0.01	0.06	< 0.01	< 0.015
	271	Radish (Estella)	1	3.97	270	29	Leaves	< 0.01	0.01	< 0.01	< 0.015
						29	Roots	< 0.01	< 0.01	< 0.01	< 0.015
		Lettuce (Tango)	1	3.97	270	37	Leaves	< 0.01	< 0.01	< 0.01	< 0.015
	365	Radish (Estella)	1	4.07	350	34	Leaves	< 0.01	< 0.01 (>LOD)	< 0.01 (>LOD)	< 0.015
						34	Roots	< 0.01	< 0.01	< 0.01	< 0.015
		Lettuce (Tango)	1	3.98	340	50	Leaves	< 0.01	< 0.01	< 0.01	< 0.015
		Beans (BB 2175)		3.85	330	62	Pods	< 0.01	0.02	< 0.01	< 0.015
Porterville, CA, USA, AA110705-CA	28	Radish (Crimson Giant)	1	4.01	280	116	Leaves	< 0.01 (>LOD) c< 0.01 (>LOD)	8.0	4.0	6.1
						116	Roots	< 0.01 (>LOD)	1.4	0.92	1.4
		Lettuce (Red Sails)	1	4.00	280	116	Leaves	< 0.01	0.96	0.24	0.37
		Wheat (Ultra)	1	4.03	280	138	Forage	< 0.01	0.65	0.03	0.05
						172	Hay	< 0.01	1.0	0.13	0.20
						172	Grain	< 0.01	0.04	< 0.01 (>LOD)	< 0.015
						172	Straw	< 0.01 (>LOD)	1.4	0.30	0.47
	60	Radish (Crimson Giant)	1	4.01	280	107	Leaves	< 0.01 (>LOD)	4.6 c< 0.01 (>LOD)	2.1	3.2
						107	Roots	< 0.01	0.54	0.40	0.61
		Lettuce (Red Sails)	1	4.01	280	107	Leaves	< 0.01	1.3	0.26	0.40
		Wheat (Ultra)	1	3.99	280	141	Forage	< 0.01	9.9	1.4	2.1
						146	Hay	< 0.01	4.1	0.78	1.2
						172	Grain	< 0.01	0.36	0.12	0.18
						17	Straw	< 0.01 (>LOD)	2.7	0.74	1.1
	120	Radish (Crimson Giant)	1	4.03	280	81	Leaves	< 0.01 c< 0.01 (>LOD)	1.7	0.20 c< 0.01 (>LOD)	0.32
						81	Roots	< 0.01	0.38	0.12	0.19

Location, Year, Trial Number	PBI, days	Crop (variety)	Application			Residues, mg/kg					
			No.	Rate, kg ai/ha	Spray volume (L/ha)	DAS	Matrix	Fluensulfone	TSA	BSA	Total [c]
								(>LOD)			
		Lettuce (Red Sails)	1	3.94	270	81	Leaves	< 0.01	2.7	0.34	0.52
	180	Radish (Crimson Giant)	1	4.01	280	34	Leaves	< 0.01	4.8	0.23 c< 0.01 (>LOD)	0.35
						34	Roots	< 0.01 c< 0.01 (>LOD)	0.35	0.03	0.05
		Lettuce (Red Sails)	1	3.96	270	53	Leaves	< 0.01	0.03	< 0.01	< 0.015
		Beans (Blue Lake FMIK)	1	4.00	280	87	Pods	< 0.01 (>LOD)	1.1	0.47	0.72
		Wheat (Ultra)	1	4.01	280	148	Forage	< 0.01	0.35	< 0.01	< 0.015
						217	Hay	< 0.01	1.3	< 0.01	< 0.015
						220	Grain	< 0.01	0.06	< 0.01	< 0.015
						220	Straw	< 0.01 (>LOD)	1.3	0.02	0.04
	270	Radish (Crimson Giant)	1	3.99	280	55	Leaves	< 0.01	0.18	< 0.01 (>LOD)	< 0.015
						55	Roots	< 0.01	0.01	< 0.01	< 0.015
		Lettuce (Red Sails)	1	4.01	280	55	Leaves	< 0.01 (>LOD)	< 0.01 c0.10	< 0.01	< 0.015
		Beans (Blue Lake FMIK)	1	4.01	280	88	Pods	< 0.01	0.35	0.035	0.054
		Wheat (Ultra)	1	3.95	280	136	Forage	< 0.01	0.40	< 0.01	< 0.015
						177	Hay	< 0.01 (>LOD) c< 0.01 (>LOD)	0.97	< 0.01	< 0.015
						199	Grain	< 0.01	0.01	< 0.01	< 0.015
						199	Straw	< 0.01 (>LOD)	1.5	< 0.01	< 0.015
	365	Radish (Crimson Giant)	1	3.89	270	59	Leaves	< 0.01 (>LOD) c< 0.01 (>LOD)	0.83	< 0.01 (>LOD)	< 0.025
						59	Roots	< 0.01	0.08	< 0.01	< 0.015
		Lettuce (Red Sails)	1	3.92	270	102	Leaves	< 0.01	< 0.01 (>LOD)	< 0.01	< 0.015
		Wheat (Ultra)	1	4.01	280	108	Forage	< 0.01	0.44	< 0.01	< 0.015
						143	Hay	< 0.01	0.08	< 0.01	< 0.015
						165	Grain	< 0.01	0.06	< 0.01	< 0.015
						165	Straw	< 0.01	1.8	< 0.01	< 0.015

Except where noted otherwise, no residues above the LOQ were found in any of the untreated control samples. >LOD indicates a result where residue was detected at a level above the limit of detection but below the limit of quantitation.

PBI = plant back interval.

DAS = days after sowing.

[a] Control samples for wheat hay/straw from this interval stored for longer than the verified storage stability period. Result not considered valid.

[b] Treated samples for wheat grain from this interval stored for longer than the verified storage stability period, Result not considered valid.

[c] Sum of fluensulfone and BSA, expressed as fluensulfone.

Analytical methods

Analytical methods for plant and animal commodities were evaluated by the 2014 JMPR. In the residue and storage stability studies provided to the current Meeting, residues of fluensulfone parent compound and its metabolites TSA and BSA were determined using an LC-MS/MS method (method number 1977W). Suitable validation data was generated concurrently with each residue study. Recoveries were generally acceptable (70-120%), with the exception of fluensulfone parent compound in the processed commodity potato chips for which consistently lower method validation and concurrent recoveries of 55-75% were achieved.

Stability of pesticide residues in stored analytical samples

Plant matrices

An additional storage stability study was conducted in oranges (Witte, 2016). Samples of homogenised orange (whole fruit) were fortified with fluensulfone and the metabolites BSA and TSA at 0.10 mg/kg. Fortified samples were stored in a freezer (≤ -18 °C) for 18 months. Stored samples were analysed together with concurrently fortified samples using an LC-MS/MS method (number 1977W).

Table 2 Storage stability of fluensulfone and its metabolites in orange whole fruit

Storage interval (months)	Residue in storage sample (mg/kg)	Concurrent recovery (%)
Fluensulfone		
0	0.099[a]	99
18	0.093, 0.094	98
TSA		
0	0.105[a]	105
18	0.109, 0.103	107
BSA		
0	0.092[a]	92
18	0.108, 0.104	110

[a] Mean of three determinations.

Residues of fluensulfone and the metabolites were stable in orange on frozen storage for 18 months.

Stability data in carrots was generated as part of the residue study (Lennon, 2015-a). Carrot root samples were fortified with 0.10 mg/kg of fluensulfone, TSA and BSA and stored frozen.

Table 3 Stability of fluensulfone residues in stored carrot root samples

Analyte	Storage period (days)	Stored recovery (%)	Mean concurrent recovery (%)
Fluensulfone	526	81.1, 82.8, 82.8	77.1
TSA		69.8, 71.1, 71.3	81.4
BSA		85.4, 87.4, 87.7	88.1

Residues of fluensulfone, BSA, and TSA were shown to be stable in carrots for at least 17.5 months frozen storage.

Stability data in potatoes was generated as part of the residue study, with additional data in processed commodities being generated under a separate study (Lennon, 2015-b, Lennon, 2016). Samples of tubers and processed commodities (dried flakes, chips and wet peel) were fortified with 0.10 mg/kg of fluensulfone, TSA and BSA and stored frozen before withdrawal for analysis after 25–26 months.

Table 4 Stability of fluensulfone residues in stored potato (tuber and processed commodity) samples

Matrix	Analyte	Storage period (days)	Stored recovery (%)	Concurrent recovery (%)
Tubers	Fluensulfone	692	82, 83, 86	83
	TSA		96, 96, 98	101.5
	BSA		71, 75, 79	88.5
Potato flakes	Fluensulfone	264	71, 73, 74	70
		763	79, 81, 83	82
	TSA	264	85, 86, 87	92
		763	82, 88, 90	89
	BSA	264	80, 81, 83	93
		763	93, 97, 99	88
Chips	Fluensulfone	287	62, 64, 68	65
		764	57, 60, 62	58
	TSA	287	89, 96, 100	93
		764	96, 96, 101	90
	BSA	287	73, 78, 81	85
		764	99, 100, 112	83
Wet peel	Fluensulfone	165	81, 85, 86	79
		754	75, 79, 83	77
	TSA	165	93, 98, 100	99
		754	94, 95, 96	89
	BSA	165	86, 91, 91	96
		754	105, 109, 109	97

Residues of fluensulfone, BSA, and TSA were stable under frozen storage for 23 months in potato tubers, and for 25 months in dried flakes, and wet peel. Residues of BSA and TSA showed adequate stability in chips, but recoveries of fluensulfone from chips were below 70% after storage. However, concurrent and method validation recoveries for fluensulfone in chips were also comparably and consistently low.

USE PATTERN

Fluensulfone is a nematicide applied to the soil prior to sowing or transplanting of various field grown fruit and vegetable crops. Two formulations are registered in the USA, a 480 g/L emulsifiable concentrate (EC) and a 150 g/kg granule. Labels for both products were provided, and relevant GAP information is tabulated below.

Table 5 GAP table

Crop	Country	Application				
		Formulation	Method	Rate, kg ai/ha	No. (maximum seasonal rate, kg ai/ha)	PHI, days
Berries and other small fruits						
Strawberry and low growing berry including bearberry; bilberry; blueberry lowbush; cloudberry; cranberry; lingonberry; muntries; partridgeberry; strawberry; varieties and/or hybrids of these	USA	480 g/L EC	Apply to the soil a minimum of 7 days before transplanting	1.96-3.92	1-2 (3.92 kg ai/ha)	-
Brassica vegetables						
Brassica (cole leafy vegetables.	USA	480 g/L EC	Apply to the soil a	1.96-	1 (3.92 kg	-

Crop	Country	Application				
		Formulation	Method	Rate, kg ai/ha	No. (maximum seasonal rate, kg ai/ha)	PHI, days
Broccoli, cauliflower, cabbage and other brassicas including: Broccoli, Chinese (gai lon); Brussels sprouts; cabbage, cavalo broccoli; kohlrabi			minimum of 30 days before transplanting or sowing. For sowing, make two supplementary irrigations before sowing.	3.92	ai/ha)	
Fruiting vegetables, cucurbits						
Cucurbit vegetables Cucumber, squash, honeydew, watermelon and other cucurbit vegetables including: Chinese wax gourd (Chinese preserving melon); citron melon; gherkin; gourd, edible (*Lagenaria* spp. and *Luffa* spp. includes hyotan, cucuzza, hechima, Chinese okra, spaghetti squash); Fruits of the gourds (*Cucurbitaceae*) e.g. *Cucurbita pepo* (i.e. crookneck squash, straightneck squash, scallop squash, and vegetable marrow); *Sechium edule* (chayote) and other cultivars and/or hybrids of these; *Momordica* spp (includes balsam apple, balsam pear, bitter melon, Chinese cucumber); muskmelon (includes cantaloupe); pumpkin; summer squash; winter squash (includes butternut squash, calabaza, hubbard squash, acorn squash, spaghetti squash); winter muskmelon, including hybrids and/or varieties of *Cucumis melo* (including true cantaloupe, casaba, Santa Claus melon, crenshaw melon, honey balls, Persian melon, golden pershaw melon, mango melon, pineapple melon, snake melon including hybrids and/or varieties of these); *Citrullus* spp	USA	480 g/L EC	Apply a minimum of 7 days before transplanting. Apply a minimum of 14 days before direct seeding and make two supplementary irrigations prior to planting.	1.96-3.92	1 (3.92 kg ai/ha)	-
Fruiting vegetables, other than cucurbits (except sweet corn and mushrooms)						
Fruiting vegetables Tomato, bell pepper and other fruiting vegetables including: African eggplant; bush tomato; all varieties of pepper (includes pepper, chili pepper, cooking pepper, pimento, hot and sweet pepper); cocona; currant tomato; eggplant; garden huckleberry; goji berry; ground cherry; martynia; naranjilla; okra; pea eggplant; pepino; non-bell pepper; roselle; scarlet eggplant; sunberry; tomatillo; tree tomato; cultivars, varieties and/or hybrids of these	USA	480 g/L EC	Apply a minimum of 7 days before transplanting. Apply a minimum of 14 days before direct seeding and make two supplementary irrigations prior to planting.	1.96-3.92	1 (3.92 kg ai/ha)	-
Leafy vegetables						
Leafy vegetables Lettuce (head and leaf), spinach and other leafy vegetables including:	USA	480 g/L EC	Apply a minimum of 7 days before transplanting.	1.96-3.92	1 (3.92 kg ai/ha)	-

Crop	Country	Application				
		Formulation	Method	Rate, kg ai/ha	No. (maximum seasonal rate, kg ai/ha)	PHI, days
Amaranth (Chinese spinach); arugula (roquette); cardoon; celery, Chinese; celtuce; chervil; chrysanthemum, edible leaved; chrysanthemum, garland; corn salad; cress, garden; cress, upland; dandelion; dock (sorrel); endive (escarole); fennel (Florence); orach; purslane, garden; purslane. Winter; radicchio (red chicory); spinach, New Zealand; spinach, vine; Swiss chard			Apply a minimum of 14 days before direct seeding and make two supplementary irrigations prior to planting.			
Brassica leafy vegetables, including: broccoli raab (rapini); cabbage, Chinese (bok choy); cabbage, Chinese (napa); cabbage, Chinese mustard (gai choy); collards; kale; mizuna; mustard greens; mustard spinach; rape greens	USA	480 g/L EC	Apply to the soil a minimum of 30 days before transplanting or sowing. For sowing, make two supplementary irrigations before sowing.	1.96-3.92	1 (3.92 kg ai/ha)	-
Japanese mustard spinach and hot herb mustard	USA	480 g/L EC	Apply to the soil a minimum of 30 days prior to transplanting. Apply a minimum of 30 days before seeding and make two supplementary irrigations prior to planting.	1.96-3.92	1 (3.92 kg ai/ha)	-
Root and tuber vegetables						
Japanese root vegetables Root vegetables including turnip and Japanese white radish (daikon)	USA	480 g/L EC	Apply to the soil a minimum of 30 days prior to transplanting. Apply a minimum of 30 days before seeding and make two supplementary irrigations prior to planting.	1.96-3.92	1 (3.92 kg ai/ha)	-
Root vegetables (except sugar beet) subgroup Carrot, radish, turnip and other root vegetables including: Beet, garden; burdock, edible; celeriac; chervil, turnip-rooted; chicory; ginseng; horseradish; parsley, turnip-rooted; parsnip; radish, oriental; rutabaga; salsify; salsify, black; salsify, Spanish; skirret	USA	150 g/kg granule	Application is to be made 10 or more days before planting for seeded crops. Do not use in furrow at planting. Apply as a broadcast or band treatment. When applying as a broadcast prior to bedding of soil, adjust the application rate so that the final treated or bedded acre receives the 24 lb [4.04 kg ai/ha] rate.	2.02-4.04	1 (4.04 kg ai/ha)	-
Tuberous and corm vegetables	USA	150 g/kg	Application can be	2.02-	1 (4.04 kg	-

Crop	Country	Application				
		Formulation	Method	Rate, kg ai/ha	No. (maximum seasonal rate, kg ai/ha)	PHI, days
Potato, sweet potato, yam and other root vegetables including: Arracacha; arrowroot; artichoke, Chinese; artichoke, Jerusalem; canna, edible; cassava, bitter and sweet; chayote (root); chufa; dasheen (taro); ginger; leren; tanier; turmeric; yam bean ; yam, true		granule	made at planting or pre-planting. Incorporate ahead of seed-piece drop. When applying as a broadcast prior to bedding or hilling of soil, mix thoroughly with the top 4 to inches of soil and ensure there is sufficient soil moisture to release active ingredient from granules. Irrigation may be necessary. If applied as a band to pre-bedded soil, cultivate or irrigate prior to planting to ensure incorporation of the product to a depth of 6 to 8 inches.	4.04	ai/ha)	
Stalk and stem vegetables						
Celery, rhubarb	USA	480 g/L EC	Apply a minimum of 7 days before transplanting. Apply a minimum of 14 days before direct seeding and make two supplementary irrigations prior to planting.	1.96-3.92	1 (3.92 kg ai/ha)	-

RESIDUES RESULTING FROM SUPERVISED TRIALS ON CROPS

The Meeting received residue data for strawberries, brassica vegetables (cabbage and cauliflower), fruiting vegetables, cucurbits (cucumber, summer squash and melon), fruiting vegetables other than cucurbits (tomato and capsicum), leafy vegetables (head and leaf lettuce, spinach, radish leaves, mustard greens, Japanese mustard spinach, and hot herb mustard), root and tuber vegetables (potato, carrot, radish, turnip and Japanese white radish), and celery. All studies were in field-grown crops.

The residue data for cucumber, summer squash, melon, tomato, and sweet and chili peppers were evaluated by the 2014 JMPR. The data tables have been taken unaltered from the 2014 evaluation. These data were re-evaluated against a new GAP for these crops submitted to the current Meeting.

Table 6 Supervised residue trial data provided

Group	Commodity	Countries	Table
FB Berries and other small fruits	Strawberries	USA	Table 7
VB Brassica vegetables	Cabbage	USA	Table 8
	Cauliflower	USA	Table 9
VC Fruiting vegetables, Cucurbits	Cucumber	USA, Canada	Table 10
	Squash, summer	USA, Canada	Table 11
	Melons	USA	Table 12
VO Fruiting vegetables, other than cucurbits	Peppers (sweet and chilli)	USA, Canada	Table 13
	Tomato	USA, Canada	Table 14
VL Leafy vegetables	Lettuce, Head	USA	Table 15
	Lettuce, Leaf	USA	Table 16
	Komatsuma (Japanese mustard spinach)	USA	Table 18
	Mizuna (hot herb mustard)	USA	Table 19
	Mustard greens	USA	Table 20
	Radish leaves	USA	Table 21
	Spinach	USA	Table 17
	Japanese radish leaves	USA	Table 22
	Turnip leaves	USA	Table 23
VR Root and tuber vegetables	Carrot	USA, Canada	Table 24
	Potato	USA, Canada	Table 25
	Radish	USA	Table 26
	Radish, Japanese (daikon)	USA	Table 27
	Turnip	USA	Table 28
VS Stalk and stem vegetables	Celery	USA	Table 29

Strawberries

A series of residue trials was conducted in strawberries in the USA in 2013 and 2014 (Jones, 2014-a) using a 480 g/L EC formulation of fluensulfone. Trials were conducted at eight sites, with the half the trials employing application by drip irrigation and the other half using broadcast application to the soil using handheld or tractor-mounted equipment, followed by incorporation into the soil. A single application was made approximately 7 day before planting. At all sites, a single control sample and duplicate treated samples were collected at harvest maturity. At one site, additional samples were collected at intervals of 7, 14 and 21 days after the initial collection for the purpose of decline data. Residues of fluensulfone and the TSA and BSA metabolites were determined using an LC-MS/MS method (method number 1977W, with modifications). Acceptable concurrent recovery data was

provided. Samples were frozen after collection and kept frozen until analysis which was completed within 5 months of collection.

Table 7 Residues of fluensulfone in strawberries

Location, Year (variety)	Application					Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
North Rose, NY, USA, 2013 (Seascape)	1	7 DBP, Broadcast pre-plant incorporation	3.89	270	117	<u>< 0.01</u> (< 0.01, < 0.01)	0.031 (0.039, 0.023)	< 0.01 (< 0.01, < 0.01)	<u>< 0.015</u> (< 0.015, < 0.015)	AA130704-SB-NY
Athens, GA, USA, 2013/14 (Camerosa)	1	7 DBP, Drip irrigation	3.98	65000	199	<u>< 0.01</u> (< 0.01, < 0.01)	0.018 (0.017, 0.020)	0.016 (0.015, 0.017)	<u>0.025</u> (0.023, 0.026)	AA130704-SB-GA
Dover, FL, USA, 2013 (Festival)	1	7 DBP, Drip irrigation	3.93	11200	66	<u>< 0.01</u> (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (0.005, 0.005)	<u>< 0.015</u> (0.008, 0.008)	AA130704-SB-FL
Delavan, WI, USA, 2013 (Albion)	1	7 DBP, Broadcast pre-plant incorporation	3.97	210	103	<u>< 0.01</u> (< 0.01, < 0.01)	0.078 (0.059, 0.098)	< 0.01 (< 0.01, 0.008)	<u>< 0.015</u> (< 0.015, 0.012)	AA130704-SB-WI
Porterville, CA, USA, 2012 (Albion)	1	7 DBP, Drip irrigation	4.00	9110	62	<u>< 0.01</u> (< 0.01, < 0.01)	0.018 (0.019, 0.016)	0.050 (0.054, 0.045)	<u>0.077</u> (0.083, 0.069)	AA130704-SB-CA-1
Visalia, CA, USA, 2013 (Albion)	1	7 DBP, Broadcast pre-plant incorporation	4.00	230	67	<u>< 0.01</u> (< 0.01, < 0.01)	0.068 (0.086, 0.050)	0.17 (0.24, 0.11)	<u>0.26</u> (0.37, 0.17)	AA130704-SB-CA-2
Santa Maria, CA, USA, 2013 (Portola)	1	8 DBP, Drip irrigation	4.01	9050	106	<u>< 0.01</u> (< 0.01, < 0.01)	0.026 (0.026, 0.026)	0.092 (0.093, 0.090)	<u>0.14</u> (0.14, 0.14)	AA130704-SB-CA-3
					113	< 0.01 (< 0.01, < 0.01)	0.022 (0.022, 0.023)	0.084 (0.082, 0.086)	0.13 (0.13, 0.13)	
					120	< 0.01 (< 0.01, < 0.01)	0.023 (0.022, 0.024)	0.082 (0.079, 0.085)	0.13 (0.12, 0.13)	
					127	< 0.01 (< 0.01, < 0.01)	0.022 (0.025, 0.019)	0.066 (0.076, 0.058)	0.10 (0.12, 0.089)	
Hillsboro, OR, USA, 2013 (Albion)	1	7 DBP, Broadcast pre-plant incorporation	3.90	240	111	<u>< 0.01</u> (< 0.01, < 0.01)	0.024 (0.023, 0.026)	0.015 (0.013, 0.018)	<u>0.023</u> (0.020, 0.028)	AA130704-SB-OR

No residues above the LOQ were found in any of the untreated control samples. DBP = days before planting. [a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Brassica vegetables

Six trials were conducted in the USA in transplanted head cabbage together with six in cauliflower (Jones, 2015-b). Three of the cabbage and four of the cauliflower trials were conducted using broadcast application to bare soil followed by incorporation into the soil, with the other trials involving application by drip irrigation. A single application of a 480 g/L EC fluensulfone formulation was made approximately 30 days before transplanting. Five of the trials in each vegetable were conducted as single point trials, with an untreated control and duplicate treated samples being collected at normal harvest maturity. One trial in each of cabbage and cauliflower was run as a decline trial, with additional duplicate treated samples being collected at intervals before and after normal commercial harvest, however a number of samples, including that timed for commercial harvest, were lost from the cauliflower decline trial. Samples were analysed for residues of parent compound and the metabolites TSA and BSA using a method based on method number 1977W. Acceptable concurrent recovery data was provided. Analyses were completed within 7 months of sample collection.

The two cauliflower trials conducted at Porterville, CA (trial numbers AA130705-CF-CA-1 and AA130705-CF-CA-3) were not considered to be independent, since both were conducted in the same variety and with application on the same day.

Table 8 Residues of fluensulfone in cabbage, head

Location, Year (variety)	Application					Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
North Rose, NY, USA, 2013 (snowball)	1	30 DBT, Broadcast pre-plant incorporation	4.04	310	114	≤ 0.01 (< 0.01, < 0.01)	0.27 (0.23, 0.31)	0.036 (0.033, 0.040)	0.055 (0.051, 0.061)	AA130705-CB-NY
Seven Springs, NC, USA, 2013 (Early Jersey Wakefield)	1	28 DBT, Drip irrigation	4.13	9300	97	≤ 0.01 (< 0.01, < 0.01)	0.48 (0.46, 0.50)	0.72 (0.70, 0.73)	1.1 (1.1, 1.1)	AA130705-CB-NC
Thonotosassa, FL, USA, 2013/14 (Celebrat)	1	29 DBT, Drip irrigation	3.93	11200	123	≤ 0.01 (< 0.01, < 0.01)	0.011 (0.011, 0.011)	0.078 (0.082, 0.073)	0.12 (0.13, 0.11)	AA130705-CB-FL
Bagley, IA, USA, 2013 (Stonehead)	1	33 DBT, Broadcast pre-plant incorporation	4.02	250	105	≤ 0.01 (< 0.01, < 0.01)	0.26 (0.31, 0.22)	0.026 (0.026, 0.026)	0.040 (0.040, 0.040)	AA130705-CB-IA
Hinton, OK, USA, 2013 (Copenhagen Markety)	1	30 DBT, Broadcast pre-plant incorporation	4.12	210	113	≤ 0.01 (< 0.01, < 0.01)	0.36 (0.40, 0.33)	0.15 (0.15, 0.14)	0.23 (0.23, 0.21)	AA130705-CB-OK
Porterville, CA, USA, 2014 (Espresso)	1	30 DBT, Drip irrigation	3.99	9100	90	< 0.01 (< 0.01, < 0.01)	0.14 (0.13, 0.15)	0.099 (0.086, 0.11)	0.15 (0.13, 0.17)	AA130705-CB-CA
					93	< 0.01 (< 0.01, < 0.01)	0.13 (0.14, 0.13)	0.083 (0.096, 0.071)	0.13 (0.15, 0.11)	
					96	< 0.01	0.12	0.10	0.15	

Location, Year (variety)	Application					Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
						(< 0.01, < 0.01)	(0.11, 0.14)	(0.10, 0.10)	(0.15, 0.15)	
					99	< 0.01 (< 0.01, < 0.01)	0.12 (0.12, 0.12)	0.12 (0.14, 0.099)	0.18 (0.21, 0.15)	

No residues above the LOQ were found in any of the untreated control samples. DBT = days before transplanting. [a]Sum of fluensulfone and BSA, expressed as fluensulfone.

Table 9 Residues of fluensulfone in cauliflower

Location, Year (variety)	Application					Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
North Rose, NY, USA, 2013 (Snowball)	1	29 DBT, Broadcast pre-plant incorporation	3.96	310	93	< 0.01 (< 0.01, < 0.01)	< 0.01, < 0.01	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	AA130705-CF-NY
Richland, IA, USA, 2013 (Candid Charm F1)	1	26 DBT, Broadcast pre-plant incorporation	3.95	260	92	< 0.01 (< 0.01, < 0.01)	0.31 (0.29, 0.33)	0.039 (0.039, 0.039)	0.060 (0.060, 0.060)	AA130705-CF-IA
Paso Robles, CA, USA, 2013/14 (Shasta)	1	34 DBT, Broadcast pre-plant incorporation	3.94	350	171	< 0.01 (< 0.01, < 0.01)	0.26 (0.25, 0.26)	0.17 (0.17, 0.17)	0.26 (0.26, 0.26)	AA130705-CF-CA-2
Porterville, CA, USA, 2014 (Pacencia)	1	30 DBT, Drip irrigation	3.99	9100	252	< 0.01 (< 0.01, < 0.01)	0.028 (0.024, 0.033)	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	AA130705-CF-CA-1
Porterville, CA, USA, 2014 (Pacencia)	1	30 DBT, Drip irrigation	3.99	9100	125	< 0.01 (< 0.01, < 0.01)	0.033 (0.027, 0.039)	0.075 (0.070, 0.081)	0.12 (0.11, 0.12)	AA130705-CF-CA-3
					128	< 0.01 (< 0.01, < 0.01)	0.043 (0.036, 0.049)	0.075 (0.075, 0.076)	0.12 (0.12, 0.12)	
Hillsboro, OR, USA, 2013 (Symphony)	1	30 DBT, Broadcast pre-plant incorporation	3.82	230	111	< 0.01 (< 0.01, < 0.01)	0.064 (0.059, 0.068)	0.059 (0.056, 0.063)	0.091 (0.086, 0.097)	AA130705-CF-OR

No residues above the LOQ were found in any of the untreated control samples. DBT = days before transplanting. [a]Sum of fluensulfone and BSA, expressed as fluensulfone.

Fruiting vegetables, Cucurbits

The Meeting received no new residue trials in cucurbit vegetables. The residue data for cucumber, summer squash and melon submitted to the 2014 JMPR (Jones, 2011-a, and Korpalski and Riley, 2011-a) were provided again to the current Meeting and the data are reproduced below.

The two trials conducted at Branchton, Canada in melons (trial numbers M-CAN-1 and M-CAN-3) were not considered to be independent trials, as application and planting took place on the same day, with harvest 3 days apart for the two trials.

Table 10 Residues of fluensulfone in cucumber (480 g/L EC formulation)

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days						
09-1859.01 Montezuma, Georgia, USA, 2010 (Speedway)	4.01	2087	1	3 days pre-planting, drip irrigation	46	<u>< 0.01</u> (< 0.01, < 0.01)	0.049 (0.039, 0.058)	n.a.	< 0.01 (< 0.01, < 0.01)	<u>< 0.015</u> (< 0.015, < 0.015)	Korpalski & Riley, 2011a, 09-01859, R-23482
					49	< 0.01 (< 0.01, < 0.01)	0.061 (0.056, 0.065)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
					53	< 0.01 (< 0.01, < 0.01)	0.051 (0.049, 0.052)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
					56	< 0.01 (< 0.01, < 0.01)	0.068 (0.050, 0.085)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
					60	< 0.01 (< 0.01, < 0.01)	0.037 (0.039, 0.035)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
09-1859.02 Clermont, Florida, USA, 2009 (Marketmore 76)	4.00	2083	1	3 days pre-planting, drip irrigation	70	< 0.01 (< 0.01, < 0.01)	0.028 (0.020, 0.035)	n.a.	0.016 (0.012, 0.019)	0.024 (0.018, 0.029)	Korpalski & Riley, 2011a, 09-01859, R-23482
					73	< 0.01 (< 0.01, < 0.01)	0.022 (0.029, 0.014)	n.a.	0.012 (0.013, < 0.01)	0.018 (0.020, < 0.015)	
					77	< 0.01 (< 0.01, < 0.01)	0.021 (0.028, 0.014)	n.a.	0.011 (0.012, < 0.01)	0.016 (0.018, < 0.015)	
					80	< 0.01 (< 0.01, < 0.01)	0.020 (0.013, 0.026)	n.a.	0.011 (< 0.01, 0.012)	0.016 (< 0.015, 0.018)	
					84	<u>< 0.01</u> (< 0.01, < 0.01)	0.029 (0.020, 0.037)	n.a.	0.016 (< 0.01, 0.022)	<u>0.025</u> (< 0.015, 0.034)	
09-1859.03 Fresno, California, USA, 2009 (Straight Eight)	4.00	2083	1	3 days pre-planting, drip irrigation	78	<u>< 0.01</u> (< 0.01, < 0.01)	0.077 (0.063, 0.090)	n.a.	0.060 (0.048, 0.071)	<u>0.092</u> (0.074, 0.11)	Korpalski & Riley, 2011a, 09-01859, R-23482
					81	< 0.01 (< 0.01, < 0.01)	0.044 (0.050, 0.038)	n.a.	0.031 (0.030, 0.032)	0.048 (0.046, 0.049)	
					85	< 0.01 (< 0.01, < 0.01)	0.051 (0.056, 0.046)	n.a.	0.032 (0.032, 0.033)	0.050 (0.049, 0.051)	
					88	< 0.01 (< 0.01, < 0.01)	0.040 (0.040, 0.040)	n.a.	0.032 (0.035, 0.028)	0.049 (0.054, 0.043)	
					92	< 0.01 (< 0.01, < 0.01)	0.048 (0.052, 0.044)	n.a.	0.026 (0.034, 0.018)	0.040 (0.052, 0.028)	

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days						
CU-CA Visalia, California, USA, 2010 (Poinsett 76)	4.09	379	1	7 days pre-planting, broadcast spray	70	<u>< 0.01</u> (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	<u>< 0.015</u>	Jones, 2011a, AA100708, R-23488
	4.00	9000	1	7 days pre-planting, drip irrigation	70	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
CU-FL Hobe Sound, Florida, USA, 2010 (Impact)	3.87	222	1	7 days pre-planting, broadcast spray	45	<u>< 0.01</u> (< 0.01, < 0.01)	0.044 (0.048, 0.040)	0.029 (0.028, 0.029)	0.070 (0.076, 0.064)	<u>0.11</u> (0.12, 0.098)	Jones, 2011a, AA100708, R-23488
CU-GA Athens, Georgia, USA, 2010 (Burpless Hybrid)	4.05	361	1	7 days pre-planting, broadcast spray	71	<u>< 0.01</u> (< 0.01, < 0.01)	0.083 (0.081, 0.084)	0.011 (0.011, 0.011)	0.010 (0.010, 0.010)	<u>0.015</u> (0.015, 0.015)	Jones, 2011a, AA100708, R-23488
CU-NC Seven Springs, North Carolina, USA, 2010 (Ashley)	4.10	358	1	7 days pre-planting, broadcast spray	41	< 0.01 (< 0.01, < 0.01)	0.47 (0.41, 0.52)	0.023 (0.021, 0.024)	0.15 (0.085, 0.22)	0.23 (0.13, 0.34)	Jones, 2011a, AA100708, R-23488
	4.00	9000	1	7 days pre-planting, drip irrigation	41	<u>< 0.01</u> (< 0.01, < 0.01)	0.61 (0.72, 0.50)	0.039 (0.035, 0.042)	0.22 (0.35, 0.084)	<u>0.34</u> (0.54, 0.13)	
CU-TX Raymond-ville, Texas, USA, 2010 (Sweet Slice)	3.72	261	1	7 days pre-planting, broadcast spray	46	<u>< 0.01</u> (< 0.01, < 0.01)	0.52 (0.52, 0.51)	0.075 (0.079, 0.071)	0.17 (0.18, 0.16)	<u>0.26</u> (0.27, 0.25)	Jones, 2011a, AA100708, R-23488
CU-CAN-1 Thorndale, Ontario, Canada, 2010 (Cross Country)	3.81	381	1	8 days pre-planting, broadcast spray	50	<u>< 0.01</u> (< 0.01, < 0.01)	0.23 (0.20, 0.26)	0.068 (0.061, 0.075)	0.063 (0.045, 0.081)	<u>0.097</u> (0.069, 0.12)	Jones, 2011a, AA100708, R-23488
CU-CAN-2 Portage la Prairie, Manitoba, Canada, 2010 (Slicing)	4.11	359	1	7 days pre-planting, broadcast spray	73	<u>< 0.01</u> (< 0.01, < 0.01)	0.064 (0.058, 0.070)	< 0.01 (< 0.01, < 0.01)	0.010 (< 0.01, 0.011)	<u>0.015</u> (< 0.015, 0.017)	Jones, 2011a, AA100708, R-23488

Fluensulfone = MCW-2

TSA = Thiazole sulfonic acid (M-3625)

MeS = Thiazole methyl sulfone (M-3626)

BSA = Butene sulfonic acid (M-3627)

[a]Sum of fluensulfone and BSA, expressed as fluensulfone.

Table 11 Residues of fluensulfone in summer squash (480 g/L EC formulation)

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
SQ-CA Porterville, California, USA, 2010 (Dark Green Zucchini)	3.82	286	1	7 days pre-planting, broadcast spray	49	< 0.01 (< 0.01, < 0.01)	0.034 (0.040, 0.028)	< 0.01 (< 0.01, < 0.01)	0.012 (0.014, 0.010)	0.028 (0.031, 0.025)	Jones, 2011a, AA100708, R-23488
	4.00	9000	1	7 days pre-planting, drip irrigation	49	< 0.01 (< 0.01, < 0.01)	0.10 (0.079, 0.13)	< 0.01 (< 0.01, < 0.01)	0.060 (0.062, 0.058)	0.10 (0.11, 0.10)	
SQ-FL Dover, Florida, USA, 2010 (Enterprise)	4.01	250	1	7 days pre-planting, broadcast spray	36	< 0.01 (< 0.01, < 0.01)	0.11 (0.12, 0.11)	< 0.01 (< 0.01, < 0.01)	0.082 (0.086, 0.078)	0.14 (0.14, 0.13)	Jones, 2011a, AA100708, R-23488
SQ-NC Seven Springs, North Carolina, USA, 2010 (Early Prolific Straight Neck)	4.02	352	1	7 days pre-planting, broadcast spray	41	< 0.01 (< 0.01, < 0.01)	0.71 (0.70, 0.72)	0.035 (0.033, 0.037)	0.19 (0.21, 0.16)	0.30 (0.33, 0.26)	Jones, 2011a, AA100708, R-23488
SQ-OK Hinton, Oklahoma, USA, 2010 (Enterprise)	4.02	256	1	6 days pre-planting, broadcast spray	61	< 0.01 (< 0.01, < 0.01)	0.46 (0.37, 0.56)	0.021 (0.023, 0.018)	0.21 (0.20, 0.23)	0.33 (0.32, 0.36)	Jones, 2011a, AA100708, R-23488
SQ –WA Ephrata, Washington, USA, 2010 (Aristocrat)	4.14	389	1	7 days pre-planting, broadcast spray	62	< 0.01 (< 0.01, < 0.01)	0.25 (0.27, 0.24)	0.048 (0.050, 0.045)	0.25 (0.26, 0.24)	0.39 (0.41, 0.38)	Jones, 2011a, AA100708, R-23488
SQ-CAN-1 Berwick, Nova Scotia, Canada, 2010 (Payroll)	4.07	363	1	7 days pre-planting, broadcast spray	38	< 0.01 (< 0.01, < 0.01)	0.27 (0.29, 0.25)	0.014 (0.016, 0.011)	0.20 (0.22, 0.17)	0.32 (0.35, 0.27)	Jones, 2011a, AA100708, R-23488
SQ-CAN-2 Branchton, Ontario, Canada, 2010 (Senator)	3.89	241	1	6 days pre-planting, broadcast spray	45	0.014 (< 0.01, 0.017)	0.057 (0.063, 0.051)	0.012 (0.013, 0.010)	0.050 (0.065, 0.035)	0.091 (0.11, 0.071)	Jones, 2011a, AA100708, R-23488
	4.00	9000	1	6 days pre-planting, drip irrigation	45	< 0.01 (< 0.01, < 0.01)	0.050 (0.038, 0.061)	< 0.01 (< 0.01, < 0.01)	0.045 (0.029, 0.060)	0.079 (0.054, 0.10)	
SQ-CAN-3 Elm Creek, Manitoba, Canada, 2010 (Zucchini)	3.80	286		7 days pre-planting, broadcast spray	71	< 0.01 (< 0.01, < 0.01)	0.035 (0.036, 0.034)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.025 (< 0.025, < 0.025)	Jones, 2011a, AA100708, R-23488

Fluensulfone = MCW-2

TSA = Thiazole sulfonic acid (M-3625)

MeS = Thiazole methyl sulfone (M-3626)

BSA = Butene sulfonic acid (M-3627)

[a]Sum of fluensulfone and BSA, expressed as fluensulfone.

Table 12 Residues of fluensulfone in melons (480 g/L EC formulation)

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
09-1859.04 Montezuma, Georgia, USA, 2009 (Ambrosia Hybrid)	4.00	2087	1	3 days pre-planting, drip irrigation	70	<u>< 0.01</u> (< 0.01, < 0.01)	0.060 (0.067, 0.053)	n.a.	0.010 (0.01, < 0.01)	<u>0.015</u> (0.015, < 0.015)	Korpalski & Riley, 2011a, 09-01859, R-23482
					73	< 0.01 (< 0.01, < 0.01)	0.041 (0.037, 0.045)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
					77	< 0.01 (< 0.01, < 0.01)	0.031 (0.031, 0.031)	n.a.	0.01 (< 0.01, 0.010)	0.015 (< 0.015, 0.015)	
					80	< 0.01 (< 0.01, < 0.01)	0.16 (0.14, 0.18)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
09-1859.05 Fresno, California, USA, 2009 (Yuma Grande F1)	4.00	2083	1	3 days pre-planting, drip irrigation	77	< 0.01 (< 0.01, < 0.01)	0.16 (0.14, 0.18)	n.a.	0.090 (0.091, 0.089)	0.14 (0.14, 0.14)	Korpalski & Riley, 2011a, 09-01859, R-23482
					80	<u>< 0.01</u> (< 0.01, < 0.01)	0.21 (0.20, 0.22)	n.a.	0.11 (0.12, 0.10)	<u>0.17</u> (0.18, 0.16)	
					84	< 0.01 (< 0.01, < 0.01)	0.15 (0.15, 0.16)	n.a.	0.072 (0.070, 0.074)	0.11 (0.11, 0.11)	
					87	< 0.01 (< 0.01, < 0.01)	0.13 (0.13, 0.13)	n.a.	0.060 (0.060, 0.060)	0.092 (0.092, 0.092)	
					91	< 0.01 (< 0.01, < 0.01)	0.10 (0.090, 0.11)	n.a.	0.046 (0.050, 0.042)	0.071 (0.077, 0.064)	
M-CA-1 King City, California, USA, 2010 (Hale's Best Jumbo)	3.93	383	1	7 days pre-planting, broadcast spray	133	<u>< 0.01</u> (< 0.01, < 0.01)	0.017 (0.016, 0.018)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	<u>< 0.015</u> (< 0.015, < 0.015)	Jones, 2011a, AA100708, R-23488
M-CA-2 Arroyo Grande, California, USA, 2010 (Top Mark)	3.85	365	1	7 days pre-planting, broadcast spray	97	<u>< 0.01</u> (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01	<u>< 0.015</u> (< 0.015, < 0.015)	Jones, 2011a, AA100708, R-23488
M-NC Seven Springs, North Carolina, USA, 2010 (Hales Best)	4.10	359	1	7 days pre-planting, broadcast spray	66	<u>< 0.01</u> (< 0.01, < 0.01)	0.56 (0.67, 0.44)	< 0.01 (< 0.01, < 0.01)	0.049 (0.061, 0.036)	<u>0.075</u> (0.094, 0.055)	Jones, 2011a, AA100708, R-23488

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
M-OK Hinton, Oklahoma, USA, 2010 (Caravelle)	3.98	253	1	6 days pre-planting, broadcast spray	82	< 0.01 (< 0.01, < 0.01)	0.30 (0.30, 0.29)	< 0.01 (< 0.01, < 0.01)	0.064 (0.065, 0.062)	0.098 (0.10, 0.095)	Jones, 2011a, AA100708, R-23488
M-CAN-2 Portage la Prairie, Manitoba Canada, 2010 (Athena)	4.11	359	1	7 days pre-planting, broadcast spray	91	< 0.01 (< 0.01, < 0.01)	0.16 (0.17, 0.15)	< 0.01 (< 0.01, < 0.01)	0.032 (0.034, 0.030)	0.049 (0.052, 0.046)	Jones, 2011a, AA100708, R-23488
M-CAN-1 Branchton, Ontario, Canada, 2010 (Primo)	4.04	253	1	6 days pre-planting, broadcast spray	80	< 0.01 (< 0.01, < 0.01)	0.041 (0.032, 0.050)	< 0.01 (< 0.01, < 0.01)	0.021 (0.015, 0.027)	0.032 (0.023, 0.041)	Jones, 2011a, AA100708, R-23488
M-CAN-3 Branchton, Ontario, Canada, 2010 (Early Sweet)	4.02	251	1	6 days pre-planting, broadcast spray	83	< 0.01 (< 0.01, < 0.01)	0.097 (0.10, 0.091)	< 0.01 (< 0.01, < 0.01)	0.025 (0.030, 0.020)	0.038 (0.046, 0.031)	Jones, 2011a, AA100708, R-23488
M-CA-3 Corning, California, USA, 2010 (ACR 215)	4.02	233	1	7 days pre-planting, broadcast spray	92	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	Jones, 2011a, AA100708, R-23488

Fluensulfone = MCW-2

TSA = Thiazole sulfonic acid (M-3625)

MeS = Thiazole methyl sulfone (M-3626)

BSA = Butene sulfonic acid (M-3627)

[a]Sum of fluensulfone and BSA, expressed as fluensulfone.

Fruiting vegetables, other than Cucurbits

The Meeting received no new residue trials in fruiting vegetables other than cucurbits. The residue data for tomato, sweet pepper (capsicum) and chilli pepper submitted to the 2014 JMPR (Jones, 2011-b and Korpalski and Riley, 2011-b) were provided again to the current Meeting and the data are reproduced essentially unaltered from the 2014 evaluation below.

The two tomato trials at Porterville (trial numbers T-CA-2 and T-CA-3) were not considered independent as application was only a week apart for the two trials). Three pairs of Canadian trials at the same locations (T-CAN-1 and T-CAN-2, at Thorndale, applications on the same day; T-CAN-5 and T-CAN-6, at Branchton, applications 2 days apart; and T-CAN-4 and T-CAN-8, at Elm Creek, applications 5 days apart) were not considered independent due to the closeness of the application timings.

Table 13 Residues of fluensulfone in peppers

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
09-1858.04 Montezuma, Georgia, USA, 2009 (Aristotle X3R)	4.01	2087	1	3 days pre-planting, drip irrigation	53	< 0.01 (< 0.01, < 0.01)	0.067 (0.064, 0.069)	n.a.	0.019 (0.019, 0.018)	0.029 (0.029, 0.028)	Korpalski & Riley, 2011b, 09-01858, R-23481
					56	< 0.01 (< 0.01, < 0.01)	0.069 (0.073, 0.064)	n.a.	0.021 (0.022, 0.020)	0.032 (0.034, 0.031)	
					60	< 0.01 (< 0.01, < 0.01)	0.072 (0.074, 0.069)	n.a.	0.015 (0.015, 0.015)	0.023 (0.023, 0.023)	
					63	< 0.01 (< 0.01, < 0.01)	0.068 (0.065, 0.070)	n.a.	0.016 (0.016, 0.016)	0.025 (0.025, 0.025)	
					67	< 0.01 (< 0.01, < 0.01)	0.055 (0.052, 0.058)	n.a.	0.015 (0.014, 0.016)	0.023 (0.021, 0.025)	
	4.01	2087	1	30 days post-planting, drip irrigation	20	< 0.01 (< 0.01, < 0.01)	0.12 (0.14, 0.11)	n.a.	0.22 (0.23, 0.21)	0.34 (0.35, 0.32)	
					23	< 0.01 (< 0.01, < 0.01)	0.12 (0.12, 0.12)	n.a.	0.21 (0.22, 0.20)	0.32 (0.34, 0.31)	
					27	< 0.01 (< 0.01, < 0.01)	0.13 (0.12, 0.15)	n.a.	0.20 (0.18, 0.23)	0.31 (0.28, 0.35)	
					30	< 0.01 (< 0.01, < 0.01)	0.11 (0.12, 0.11)	n.a.	0.18 (0.18, 0.18)	0.29 (0.29, 0.29)	
					34	< 0.01 (< 0.01, < 0.01)	0.095 (0.090, 0.099)	n.a.	0.19 (0.16, 0.21)	0.29 (0.25, 0.32)	
09-1858.05 Clermont, Florida, USA, 2009 (Patriot)	4.02	2088	1	3 days pre-planting, drip irrigation	65	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	Korpalski & Riley, 2011b, 09-01858, R-23481
					68	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
					72	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
					75	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
					79	< 0.01 (< 0.01, < 0.01)	0.010 (0.011, < 0.01)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
	4.02	2088	1	36 days post-planting, drip irrigation	26	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	0.031 (0.032, 0.030)	0.048 (0.049, 0.046)	

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
					29	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	0.030 (0.027, 0.033)	0.046 (0.041, 0.051)	
					33	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	0.024 (0.027, 0.021)	0.037 (0.041, 0.032)	
					36	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	0.019 (0.019, 0.018)	0.029 (0.029, 0.028)	
					40	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	0.021 (0.020, 0.021)	0.032 (0.031, 0.032)	
NB-CA Porterville, California, USA, 2010 (Fresno)	3.98	301	1	7 days pre-planting, broadcast spray	83	< 0.01 (< 0.01, < 0.01)	0.035 (0.037, 0.033)	< 0.01 (< 0.01, < 0.01)	0.040 (0.049, 0.031)	0.061 (0.075, 0.048)	Jones, 2011b, AA100707, R-23487
	3.93 + 2.0	297 + 9000	1	7 days pre-planting by broadcast spray + 40 days post planting by drip irrigation	43	< 0.01 (< 0.01, < 0.01)	0.15 (0.14, 0.16)	< 0.01 (< 0.01, < 0.01)	0.38 (0.36, 0.39)	0.58 (0.55, 0.60)	
					46	< 0.01 (< 0.01, < 0.01)	0.14	< 0.01 (< 0.01, < 0.01)	0.28 (0.30, 0.25)	0.43 (0.46, 0.38)	
					51	< 0.01 (< 0.01, < 0.01)	0.17	0.010 (0.011, < 0.01)	0.32 (0.28, 0.36)	0.49 (0.43, 0.55)	
					53	< 0.01 (< 0.01, < 0.01)	0.14	< 0.01 (0.01, < 0.01)	0.29 (0.27, 0.32)	0.44 (0.41, 0.49)	
					56	< 0.01 (< 0.01, < 0.01)	0.16	< 0.01 (< 0.01, < 0.01)	0.19 (0.23, 0.16)	0.29 (0.35, 0.25)	
NB-FL Oviedo, Florida, USA, 2010 (Sweet Banana)	3.90	279	1	7 days pre-planting, broadcast spray	50	< 0.01 (< 0.01, < 0.01)	0.089 (0.092, 0.086)	< 0.01 (< 0.01, < 0.01)	0.18 (0.20, 0.17)	0.28 (0.31, 0.26)	Jones, 2011b, AA100707, R-23487
	3.92 + 2.0	280 + 9000	1	7 days pre-planting by broadcast spray + 40 days post planting by drip irrigation	3	< 0.01 (< 0.01, < 0.01)	0.084 (0.092, 0.076)	< 0.01 (< 0.01, < 0.01)	0.24 (0.25, 0.22)	0.37 (0.38, 0.34)	
NB-OK Hinton, Oklahoma, USA, 2010	4.03	539	1	7 days pre-planting, broadcast spray	101	< 0.01 (< 0.01, < 0.01)	0.25 (0.22, 0.27)	< 0.01 (< 0.01, < 0.01)	0.041 (0.044, 0.037)	0.063 (0.067, 0.057)	Jones, 2011b, AA100707, R-23487

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
(Tam Jalapeno)	4.08 + 2.0	546 + 9006	1	7 days pre-planting by broadcast spray + 40 days post planting by drip irrigation	53	< 0.01 (< 0.01, < 0.01)	0.38	0.01 (0.011, < 0.01)	0.088 (0.092, 0.084)	0.14 (0.14, 0.13)	
NB-CAN Portage la Prairie, Manitoba, Canada, 2010 (Hungarian Yellow Wax)	4.07	356	1	7 days pre-planting, broadcast spray	102	< 0.01 (< 0.01, < 0.01)	0.19 (0.20, 0.18)	0.012 (0.012, 0.012)	0.14 (0.14, 0.13)	0.21 (0.22, 0.20)	Jones, 2011b, AA100707, R-23487
	3.93 + 4.00	344 + 9000	1	7 days pre-planting by broadcast spray + 40 days post planting by drip irrigation	56	< 0.01 (< 0.01, < 0.01)	0.15 (0.16, 0.14)	0.022 (0.024, 0.019)	0.29 (0.30, 0.28)	0.44 (0.46, 0.42)	
09-1858.06 Fresno, California, USA, 2009 (Baron)	4.00	2088	1	3 days pre-planting, drip irrigation	102	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	Korpalski & Riley, 2011b, 09-01858, R-23481
					105	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
					109	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
					112	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
					116	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
	4.00	2088	1	38 days post-planting, drip irrigation	61	< 0.01 (< 0.01, < 0.01)	0.019 (0.021, 0.016)	n.a.	0.041 (0.041, 0.040)	0.062 (0.063, 0.061)	
					64	< 0.01 (< 0.01, < 0.01)	0.015 (0.013, 0.017)	n.a.	0.029 (0.025, 0.032)	0.044 (0.038, 0.049)	
					68	< 0.01 (< 0.01, < 0.01)	0.014 (0.013, 0.015)	n.a.	0.028 (0.029, 0.026)	0.043 (0.044, 0.040)	
					71	< 0.01 (< 0.01, < 0.01)	0.015 (0.015, 0.014)	n.a.	0.024 (0.027, 0.021)	0.037 (0.041, 0.032)	
					75	< 0.01 (< 0.01, < 0.01)	0.011 (0.010, 0.011)	n.a.	0.019 (0.019, 0.018)	0.028 (0.029, 0.028)	

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
BP-CA Porterville, California, USA, 2010 (Californian Wonder)	3.87	342	1	7 days pre-planting, broadcast spray	104	<u>< 0.01</u> (< 0.01, < 0.01)	0.027 (0.027, 0.027)	< 0.01 (< 0.01, < 0.01)	0.070 (0.067, 0.072)	<u>0.11</u> (0.10, 0.11)	Jones, 2011b, AA100707, R-23487
	4.01	9000	1	7 days pre-planting, drip irrigation	104	< 0.01 (< 0.01, < 0.01)	0.074 (0.080, 0.067)	< 0.01 (< 0.01, < 0.01)	0.068 (0.073, 0.062)	0.10 (0.11, 0.095)	
	3.9 + 2.0	345 + 9000	1	7 days pre-planting by broadcast spray + 40 days post planting by drip irrigation	63	< 0.01 (< 0.01, < 0.01)	0.029 (0.031, 0.027)	< 0.01 (< 0.01, < 0.01)	0.059 (0.063, 0.055)	0.091 (0.097, 0.084)	
BP-FL Oviedo, Florida, USA, 2010 (Green Bell)	3.97	284	1	7 days pre-planting, broadcast spray	63	<u>< 0.01</u> (< 0.01, < 0.01)	0.17 (0.15, 0.19)	0.013 (0.014, 0.012)	0.23 (0.22, 0.24)	<u>0.36</u> (0.35, 0.37)	Jones, 2011b, AA100707, R-23487
	3.94 + 2.0	282 + 9000	1	7 days pre-planting by broadcast spray + 40 days post planting by drip irrigation	16	< 0.01 (< 0.01, < 0.01)	0.17 (0.17, 0.17)	0.011 (0.012, 0.010)	0.38 (0.38, 0.37)	0.58 (0.58, 0.57)	
BP-NC Seven Springs, North Carolina, USA, 2010 (Jupiter)	4.02	351	1	7 days pre-planting, broadcast spray	73	<u>< 0.01</u> (< 0.01, < 0.01)	0.46 (0.44, 0.48)	< 0.01 (< 0.01, < 0.01)	0.055 (0.055, 0.054)	<u>0.084</u> (0.084, 0.083)	Jones, 2011b, AA100707, R-23487
	3.99 + 2.0	349 + 6279	1	7 days pre-planting by broadcast spray + 40 days post planting by drip irrigation	26	< 0.01 (< 0.01, < 0.01)	1.2 (1.1, 1.3)	< 0.01 (< 0.01, < 0.01)	0.13 (0.12, 0.14)	0.20 (0.18, 0.22)	
					29	< 0.01 (< 0.01, < 0.01)	0.97 (0.92, 1.03)	< 0.01 (< 0.01, < 0.01)	0.12 (0.11, 0.13)	0.18 (0.17, 0.20)	
					33	< 0.01 (< 0.01, < 0.01)	1.0 (1.1, 0.85)	< 0.01 (< 0.01, < 0.01)	0.14 (0.17, 0.12)	0.21 (0.25, 0.18)	
					35	< 0.01 (< 0.01, < 0.01)	0.76 (1.0, 0.52)	< 0.01 (< 0.01, < 0.01)	0.092 (0.13, 0.052)	0.14 (0.20, 0.080)	
					40	< 0.01 (< 0.01, < 0.01)	0.92 (0.90, 0.93)	< 0.01 (< 0.01, < 0.01)	0.096 (0.099, 0.092)	0.15 (0.15, 0.14)	

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
BP-OK Hinton, Oklahoma, USA, 2010 (XR3 Camelot Sweet Bell)	4.10	534	1	7 days pre-planting, broadcast spray	108	<u>< 0.01</u> (< 0.01, < 0.01)	0.34 (0.34, 0.35)	< 0.01 (< 0.01, < 0.01)	0.082 (0.086, 0.078)	<u>0.13</u> (0.13, 0.12)	Jones, 2011b, AA100707, R-23487
	4.11 + 2.0	535 + 9002	1	7 days pre-planting by broadcast spray + 40 days post planting by drip irrigation	64	< 0.01 (< 0.01, < 0.01)	0.47 (0.51, 0.42)	< 0.01 (< 0.01, < 0.01)	0.16 (0.15, 0.16)	0.24 (0.23, 0.25)	
BP-CAN-1 Thorndale, Ontario, Canada, 2010 (Revolution)	3.84	384	1	8 days pre-planting, broadcast spray	63	<u>< 0.01</u> (< 0.01, < 0.01)	0.28 (0.29, 0.27)	< 0.01 (< 0.01, < 0.01)	0.063 (0.065, 0.060)	<u>0.096</u> (0.10, 0.092)	Jones, 2011b, AA100707, R-23487
	3.85 + 2.0	385 + 9000	1	8 days pre-planting by broadcast spray + 9 days post planting by drip irrigation	46	< 0.01 (< 0.01, < 0.01)	0.33 (0.31, 0.35)	0.017 (0.016, 0.017)	0.26 (0.27, 0.24)	0.39 (0.41, 0.37)	
BP-CAN-2 Portage la Prairie, Manitoba, Canada, 2010 (Californian Wonder)	4.07	355	1	7 days pre-planting, broadcast spray	102	<u>< 0.01</u> (< 0.01, < 0.01)	0.17 (0.17, 0.16)	< 0.01 (< 0.01, < 0.01)	0.048 (0.049, 0.047)	<u>0.074</u> (0.075, 0.072)	Jones, 2011b, AA100707, R-23487
	4.14 + 2.0	362 + 9000	1	7 days pre-planting by broadcast spray + 40 days post planting by drip irrigation	56	< 0.01 (< 0.01, < 0.01)	0.17 (0.17, 0.16)	< 0.01 (< 0.01, < 0.01)	0.16 (0.15, 0.17)	0.24 (0.23, 0.25)	
BP-CAN-3 Branchton, Ontario, Canada, 2010 (Aristotle)	3.82	239	1	7 days pre-planting, broadcast spray	76	< 0.01 (< 0.01, < 0.01)	0.066 (0.059, 0.073)	< 0.01 (< 0.01, < 0.01)	0.032 (0.027, 0.036)	0.049 (0.041, 0.055)	Jones, 2011b, AA100707, R-23487
	4.00	9000	1	7 days pre-planting, drip irrigation	76	<u>< 0.01</u> (< 0.01, < 0.01)	0.12 (0.11, 0.12)	< 0.01 (< 0.01, < 0.01)	0.073 (0.068, 0.077)	<u>0.11</u> (0.10, 0.12)	
	4.07 + 4.00	254 + 9000	1	7 days pre-planting by broadcast spray + 40 days post planting by drip irrigation	27	< 0.01 (< 0.01, < 0.01)	0.076 (0.077, 0.075)	< 0.01 (< 0.01, < 0.01)	0.15 (0.13, 0.16)	0.22 (0.20, 0.25)	

Fluensulfone = MCW-2

TSA = Thiazole sulfonic acid (M-3625)

MeS = Thiazole methyl sulfone (M-3626)

BSA = Butene sulfonic acid (M-3627)

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Table 14 Residues of fluensulfone in tomatoes (480 g/L EC formulation)

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
09-1858.01 Clermont, Florida, USA, 2010 (Celebrity)	4.01	2083	1	3 days pre-planting, drip irrigation	73	<u>< 0.01</u> (< 0.01, < 0.01)	0.040 (0.042, 0.037)	n.a.	0.044 (0.044, 0.044)	<u>0.068</u> (0.068, 0.068)	Korpalski & Riley, 2011b, 09-01858, R-23481
					77	< 0.01 (< 0.01, < 0.01)	0.012 (0.014, 0.010)	n.a.	0.018 (0.021, 0.014)	0.027 (0.032, 0.021)	
					80	< 0.01 (< 0.01, < 0.01)	0.014 (0.016, 0.012)	n.a.	0.016 (0.017, 0.014)	0.024 (0.026, 0.021)	
					84	< 0.01 (< 0.01, < 0.01)	0.010 (0.010, 0.010)	n.a.	0.012 (0.012, 0.011)	0.018 (0.018, 0.017)	
					87	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	
09-1858.02 Fresno, California, USA, 2009 (H 8004 Processing)	4.00	2088	1	3 days pre-planting, drip irrigation	115	<u>< 0.01</u> (< 0.01, < 0.01)	0.017 (0.016, 0.018)	n.a.	< 0.01 (< 0.01, < 0.01)	<u>< 0.015</u> (< 0.015, < 0.015)	Korpalski & Riley, 2011b, 09-01858, R-23481
					118	< 0.01 (< 0.01, < 0.01)	0.027 (0.024, 0.030)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015	
					122	< 0.01 (< 0.01, < 0.01)	0.023 (0.023, 0.023)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015	
					125	< 0.01 (< 0.01, < 0.01)	0.026 (0.026, 0.025)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015	
					129	< 0.01 (< 0.01, < 0.01)	0.026 (0.022, 0.029)	n.a.	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015	
09-1858.03 Madera, California, USA, 2009 (H 8004 Processing)	3.99	2086	1	3 days pre-planting, drip irrigation	122	<u>< 0.01</u> (< 0.01, < 0.01)	0.026 (0.029, 0.023)	n.a.	0.017 (0.016, 0.018)	<u>0.026</u> (0.025, 0.028)	Korpalski & Riley, 2011b, 09-01858, R-23481
					125	< 0.01 (< 0.01, < 0.01)	0.040 (0.036, 0.043)	n.a.	0.014 (0.012, 0.016)	0.021 (0.018, 0.025)	
					129	< 0.01 (< 0.01, < 0.01)	0.029 (0.034, 0.024)	n.a.	0.011 (0.010, 0.012)	0.017 (0.015, 0.018)	

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
					132	< 0.01 (< 0.01, < 0.01)	0.030 (0.034, 0.025)	n.a.	0.016 (0.018, 0.014)	0.025 (0.028, 0.021)	
					136	< 0.01 (< 0.01, < 0.01)	0.024 (0.028, 0.020)	n.a.	0.017 (0.019, 0.014)	0.025 (0.029, 0.021)	
T-CA-1 Corning, California, USA, 2010 (AB-3)	4.02	233	1	7 days pre-planting, broadcast spray	114	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	Jones, 2011b, AA100707, R-23487
	8.02	232	1	7 days pre-planting, broadcast spray	114	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015)	
T-CA-2 Porterville, California, USA, 2010 (Rio Grande)	3.92	296	1	7 days pre-planting, broadcast spray	112	< 0.01 (< 0.01, < 0.01)	0.045 (0.036, 0.053)	< 0.01 (< 0.01, < 0.01)	0.087 (0.059, 0.11)	0.13 (0.091, 0.17)	Jones, 2011b, AA100707, R-23487
T-CA-3 Porterville, California, USA, 2010 (Champion)	3.92	344	1	7 days pre-planting, broadcast spray	146	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	0.017 (0.014, 0.020)	0.026 (0.021, 0.031)	Jones, 2011b, AA100707, R-23487
	4.00	9000	1	7 days pre-planting, drip irrigation	146	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	0.029 (0.024, 0.033)	0.044 (0.037, 0.051)	
T-CA-4 Livingston, California, USA, 2010 (Champion)	3.99	357	1	7 days pre-planting, broadcast spray	126	< 0.01 (< 0.01, < 0.01)	0.027 (0.026, 0.028)	< 0.01 (< 0.01, < 0.01)	0.034 (0.035, 0.033)	0.052 (0.054, 0.051)	Jones, 2011b, AA100707, R-23487
T-CA-5 King City, California, USA, 2010 (Rio Grande)	4.04	395	1	7 days pre-planting, broadcast spray	150	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	0.023 (0.024, 0.022)	0.035 (0.037, 0.034)	Jones, 2011b, AA100707, R-23487
T-CA-6 Visalia, California, USA, 2010 (Champion)	3.94	357	1	7 days pre-planting, broadcast spray	123	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	Jones, 2011b, AA100707, R-23487
T-CA-7 Chico, California, USA, 2010 (AB-3)	4.02	232	1	7 days pre-planting, broadcast spray	143	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	Jones, 2011b, AA100707, R-23487
T-CA-8 Arroyo Grande, California, USA, 2010 (Shady Lady)	3.64	345	1	7 days pre-planting, broadcast spray	113	< 0.01 (< 0.01, < 0.01)	0.016 (0.018, 0.013)	< 0.01 (< 0.01, < 0.01)	0.013 (0.015, 0.010)	0.019 (0.023, 0.015)	Jones, 2011b, AA100707, R-23487
T-FL-1 Hobe Sound, Florida,, USA, 2010 (Florida 47)	3.97	228	1	7 days pre-planting, broadcast spray	102	< 0.01 (< 0.01, < 0.01)	0.091 (0.081, 0.10)	< 0.01 (< 0.01, < 0.01)	0.27 (0.27, 0.27)	0.41 (0.42, 0.41)	Jones, 2011b, AA100707, R-23487

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
T-FL-2 Dover, Florida, USA, 2010 (Tigris)	4.04	215	1	7 days pre-planting, broadcast spray	78	<u>< 0.01</u> (< 0.01, < 0.01)	0.081 (0.086, 0.075)	< 0.01 (< 0.01, < 0.01)	0.27 (0.28, 0.27)	<u>0.41</u> (0.42, 0.41)	Jones, 2011b, AA100707, R-23487
T-NC Seven Springs, North Carolina, USA, 2010 (Homestead)	4.11	359	1	7 days pre-planting, broadcast spray	94	<u>< 0.01</u> (< 0.01, < 0.01)	0.17 (0.20, 0.14)	< 0.01 (< 0.01, < 0.01)	0.026 (0.027, 0.024)	<u>0.039</u> (0.041, 0.037)	Jones, 2011b, AA100707, R-23487
T-NY North Rose, New York, USA, 2010 (Mountain Spring)	4.02	329	1	7 days pre-planting, broadcast spray	93	<u>< 0.01</u> (< 0.01, < 0.01)	0.098 (0.080, 0.12)	< 0.01 (< 0.01, < 0.01)	0.074 (0.058, 0.090)	<u>0.11</u> (0.089, 0.14)	Jones, 2011b, AA100707, R-23487
T-CAN-1 Thorndale, Ontario, Canada, 2010 (Mariana)	3.81	381	1	7 days pre-planting, broadcast spray	101	< 0.01 (< 0.01, < 0.01)	0.23 (0.22, 0.23)	< 0.01 (< 0.01, < 0.01)	0.094 (0.085, 0.10)	0.14 (0.13, 0.15)	Jones, 2011b, AA100707, R-23487
T-CAN-2 Thorndale, Ontario, Canada, 2010 (Heinz 3478)	3.75	375	1	7 days pre-planting, broadcast spray	88	<u>< 0.01</u> (< 0.01, < 0.01)	0.26 (0.28, 0.25)	< 0.01 (< 0.01, < 0.01)	0.20 (0.18, 0.21)	<u>0.30</u> (0.28, 0.32)	Jones, 2011b, AA100707, R-23487
T-CAN-3 Portage la Prairie, Manitoba, Canada, 2010 (Fantastic)	4.07	356	1	7 days pre-planting, broadcast spray	91	<u>< 0.01</u> (< 0.01, < 0.01)	0.078 (0.067, 0.088)	< 0.01 (< 0.01, < 0.01)	0.088 (0.081, 0.095)	<u>0.14</u> (0.12, 0.15)	Jones, 2011b, AA100707, R-23487
T-CAN-5 Branchton, Ontario, Canada, 2010 (TSH 18)	3.98	249	1	7 days pre-planting, broadcast spray	83	< 0.01 (< 0.01, < 0.01)	0.12 (0.13, 0.11)	< 0.01 (< 0.01, < 0.01)	0.072 (0.076, 0.067)	0.11 (0.12, 0.10)	Jones, 2011b, AA100707, R-23487
T-CAN-6 Branchton, Ontario, Canada, 2010 (TSH 28)	3.86	241	1	7 days pre-planting, broadcast spray	85	< 0.01 (< 0.01, < 0.01)	0.075 (0.082, 0.067)	< 0.01 (< 0.01, < 0.01)	0.066 (0.077, 0.055)	0.10 (0.12, 0.084)	Jones, 2011b, AA100707, R-23487
	4.00	9000	1	7 days pre-planting, drip irrigation	85	< 0.01 (< 0.01, < 0.01)	0.096 (0.085, 0.11)	< 0.01 (< 0.01, < 0.01)	0.078 (0.069, 0.087)	0.12 (0.11, 0.13)	
T-CAN-7 Branchton, Ontario, Canada, 2010 (TSH 25)	4.01	251	1	7 days pre-planting, broadcast spray	83	<u>< 0.01</u> (< 0.01, < 0.01)	0.17 (0.16, 0.17)	< 0.01 (< 0.01, < 0.01)	0.17 (0.18, 0.17)	<u>0.26</u> (0.28, 0.25)	Jones, 2011b, AA100707, R-23487
T-CAN-4 Elm Creek, Manitoba, Canada, 2010 (Fantastic)	4.12	360	1	7 days pre-planting, broadcast spray	79	<u>< 0.01</u> (< 0.01, < 0.01)	0.33 (0.37, 0.29)	< 0.01 (< 0.01, < 0.01)	0.23 (0.26, 0.20)	<u>0.35</u> (0.40, 0.31)	Jones, 2011b, AA100707, R-23487

Trial Country, year (Variety)	Application				PHI	Fluen-sulfone	TSA	MeS	BSA	Total[a]	Reference
	Rate kg ai/ha	Water L/ha	No	Application timing, type	days	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
T-CAN-8 Elm Creek, Manitoba, Canada, 2010 (Bush Beefsteak)	3.92	296	1	7 days pre-planting, broadcast spray	85	< 0.01 (< 0.01, < 0.01)	0.055 (0.060, 0.050)	< 0.01 (< 0.01, < 0.01)	0.042 (0.044, 0.039)	0.064 (0.067, 0.060)	Jones, 2011b, AA100707, R-23487

Fluensulfone = MCW-2

TSA = Thiazole sulfonic acid (M-3625)

MeS = Thiazole methyl sulfone (M-3626)

BSA = Butene sulfonic acid (M-3627)

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Leafy vegetables

Lettuce, head, lettuce, leaf and spinach

Six trials were conducted in each of lettuce, head, lettuce, leaf and spinach in the USA (Jones, 2015-c). Three of the trials in each crop employed broadcast application using tractor mounted or handheld equipment (e.g. backpack sprayers) to bare soil followed by incorporation into the soil, with the other trials involving application to bare soil by drip irrigation. A single application of a 480 g/L EC fluensulfone formulation was made approximately 7 days before sowing or transplanting. Most of the trials were single point residue trials, with one control and duplicate treated samples being collected at commercial harvest. One head lettuce trial was conducted as a decline trial, with additional duplicate treated samples being collected at intervals a few days either side of scheduled commercial harvest. Samples were analysed for residues of parent compound and the metabolites TSA and BSA using a method based on method number 1977W. Acceptable concurrent recovery data was provided. Analyses were completed within 6 months of sample collection.

The two trials in head lettuce at Porterville, CA (trial numbers HL-CA-1 and HL-CA-4) were considered independent, as although the trials were conducted in the same year, they were conducted approximately 6 months apart.

Table 15 Residues of fluensulfone in head lettuce

Location, Year (variety)	Application					Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
North Rose, NY, USA, 2014 (Mighty Joe MI)	1	7 DBP, Broadcast pre-plant incorporation	4.00	250	64	< 0.01 (< 0.01, < 0.01)	2.2 (2.4, 2.1)	0.27 (0.28, 0.27)	0.41 (0.43, 0.41)	AA130706-HL-NY-A
Thonotosassa, FL, USA, 2013 (Keeper)	1	7 DBP, Drip irrigation	3.93	11200	53	< 0.01 (< 0.01, < 0.01)	< 0.01 (0.009, 0.008)	< 0.01 (< 0.01, 0.005)	< 0.015 (< 0.015, 0.008)	AA130706-HL-FL
King City, CA, USA, 2013 (Vandenburg)	1	7 DBP, Drip irrigation	4.00	9100	70	0.017 (0.018, 0.016)	< 0.01 (< 0.01, < 0.01)	< 0.01 (0.006, 0.005)	0.025 (0.027, 0.024)	AA130706-HL-CA-2
Paso Robles, CA, USA, 2013 (Vandenburg)	1	7 DBP, Broadcast pre-plant incorporation	4.07	310	66	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	AA130706-HL-CA-3
Porterville, CA, USA, 2013 (Great Lakes)	1	7 DBP, Broadcast pre-	3.98	280	84	< 0.01 (< 0.01,	< 0.01 (0.009,	< 0.01 (< 0.01,	< 0.015 (< 0.015,	AA130706-HL-

Location, Year (variety)	Application					Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
		plant incorporation				< 0.01)	0.008)	0.004)	0.006)	CA-1
Porterville, CA, USA, 2013 (Great Lakes 659)	1	7 DBP, Drip irrigation	4.00	9100	90	< 0.01 (0.006, < 0.01)	0.066 (0.067, 0.064)	0.032 (0.035, 0.029)	0.052 (0.060, 0.044)	AA130706-HL-CA-4
					93	< 0.01 (< 0.01, < 0.01)	0.066 (0.071, 0.062)	0.024 (0.030, 0.019)	0.037 (0.046, 0.029)	
					96	< 0.01 (< 0.01, < 0.01)	0.10 (0.098, 0.11)	0.043 (0.043, 0.043)	0.066 (0.066, 0.066)	
					99	< 0.01 (0.004, < 0.01)	0.083 (0.067, 0.10)	0.028 (0.025, 0.032)	0.046 (0.042, 0.049)	

No residues were detected in any of the untreated control samples. DBP = days before planting.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Table 16 Residues of fluensulfone in leafy lettuce and cos lettuce

Location, Year (variety)	Application					Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
Leaf lettuce										
North Rose, NY, USA, 2014 (Green Salad Bowl MI)	1	7 DBP, Broadcast pre-plant incorporation	4.02	250	61	< 0.01 (0.008, 0.007)	6.8 (7.4, 6.1) c0.01	0.88 (0.98, 0.79)	1.4 (1.5, 1.2)	AA130706-LL-NY-A
Thonotosassa, FL, USA, 2013 (North Star)	1	7 DBP, Drip irrigation	3.93	11200	43	0.013 (0.011, 0.015)	0.023 (0.018, 0.028)	0.020 (0.014, 0.025)	0.044 (0.032, 0.053)	AA130706-LL-FL
San Ardo, CA, USA, 2013 (Red Sails)	1	7 DBP, Broadcast pre-plant incorporation	3.91	230	54	< 0.01 (0.007, 0.005)	0.011 (0.012, 0.010)	< 0.01 (0.009, 0.006)	0.018 (0.021, 0.014)	AA130706-LL-CA-1
Porterville, CA, USA, 2013 (Red Sails)	1	7 DBP, Drip irrigation	4.00	9100	51	0.030 (0.035, 0.025)	0.14 (0.15, 0.13)	0.064 (0.076, 0.052)	0.13 (0.15, 0.10)	AA130706-LL-CA-4
Cos lettuce										
Paso Robles, CA, USA, 2013/14 (Green Thunder)	1	7 DBP, Broadcast pre-plant incorporation	3.96	300	116	0.059 (0.060, 0.058)	0.38 (0.38, 0.38)	0.20 (0.19, 0.20)	0.37 (0.35, 0.36)	AA130706-LL-CA-3
Arroyo Grande, CA, USA, 2013 (Green Forest)	1	8 DBP, Drip irrigation	3.98	9000	65	0.017 (0.020, 0.014) c0.004	0.029 (0.035, 0.024) c0.029	0.020 (0.022, 0.018) c0.006	0.048 (0.054, 0.042)	AA130706-LL-CA-2

Except where noted, no residues were detected in any of the untreated control samples. DBP = days before planting.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Table 17 Residues of fluensulfone in spinach

Location, Year (variety)	Application					Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
North Rose, NY, USA, 2014 (Longstand Bloomsdale)	1	7 DBS, Broadcast pre-plant incorporation	4.02	250	64	≤ 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	≤ 0.015 (< 0.015, < 0.015)	AA130706-SP-NY-A
Seven Spring, NC, USA, 2013 (Baker)	1	7 DBS, Drip irrigation	4.13	9300	81	≤ 0.01 (< 0.01, < 0.01)	0.47 (0.33, 0.60)	0.14 (0.095, 0.18)	0.21 (0.15, 0.28)	AA130706-SP-NC
Uvalde, TX, USA, 2013 (DMC 66-07)	1	7 DBS, Broadcast pre-plant incorporation	3.97	230	88	≤ 0.01 (< 0.01, < 0.01)	0.62 (0.49, 0.74)	0.38 (0.25, 0.50)	0.58 (0.38, 0.77)	AA130706-SP-TX
Smithfield, ID, USA, 2013 (Bloomsdale Long Standing)	1	9 DBS, Broadcast pre-plant incorporation	4.16	210	75	≤ 0.01 (< 0.01, < 0.01)	2.8 (2.9, 2.8)	0.51 (0.58, 0.44)	0.78 (0.89, 0.68)	AA130706-SP-ID
Porterville, CA, USA, 2013 (Bloomsdale)	1	7 DBS, Drip irrigation	3.99	9100	65	≤ 0.01 (< 0.01, < 0.01)	1.1 (1.1, 1.1)	1.2 (1.2, 1.1)	1.8 (1.8, 1.7)	AA130706-SP-CA-1
King City, CA, USA, 2013 (Violin F1)	1	7 DBS, Drip irrigation	4.00	9100	64	≤ 0.01 (< 0.01, < 0.01)	0.26 (0.25, 0.27)	0.32 (0.28, 0.37)	0.49 (0.43, 0.57)	AA130706-SP-CA-2

No residues were detected in any of the untreated control samples. DBS = days before sowing.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Mustard spinach (komatsuma) and hot herb mustard (mizuna)

Four trials in each of komatsuma and mizuna were conducted in the USA (Jones, 2014-b). Two of the trials in each crop employed broadcast application using tractor mounted or handheld equipment (e.g. backpack sprayers) to bare soil followed by incorporation into the soil, with the other trials involving application to bare soil by drip irrigation. A single application of a 480 g/L EC fluensulfone formulation was made approximately 30 days before sowing or transplanting. All trials were single point residue trials, with one control and duplicate treated samples being collected at commercial harvest. Samples were analysed for residues of parent compound and the metabolites TSA and BSA using a method based on method number 1977W. Acceptable concurrent recovery data was provided. Analyses were completed within 6 months of sample collection.

Table 18 Residues of fluensulfone in komatsuma

Location, Year (variety)	Application					Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
Frenchtown, PA, USA, 2013 (Red Komatsuma)	1	30 DBP, Broadcast pre-plant incorporation	4.17	250	70	≤ 0.01 (< 0.01, < 0.01)	1.5 (1.4, 1.5) c0.005	0.36 (0.34, 0.37)	0.54 (0.52, 0.57)	AA130710-K-PA
High Springs, FL, USA, 2013 (Tokyo Early)	1	32 DBP, Broadcast pre-plant incorporation	4.18	220	70	≤ 0.01 (< 0.01, < 0.01)	3.3 (3.0, 3.6)	0.40 (0.35, 0.45)	0.61 (0.54, 0.69)	AA130710-K-FL

Location, Year (variety)	Application					Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
Richland, IA, USA, 2013 (Komatsuma Summerfest)	1	28 DBP, Drip irrigation	3.99	10600	57	< 0.01 (< 0.01, 0.003)	4.5 (3.2, 5.9) c0.008	2.6 (1.6, 3.6)	4.0 (2.5, 5.5)	AA130710-K-IA
Porterville, CA, USA, 2013 (Komatsuma)	1	30 DBP, Drip irrigation	4.00	9100	71	< 0.01 (< 0.01, < 0.01)	1.4 (1.5, 1.2)	0.38 (0.47, 0.30)	0.59 (0.72, 0.46)	AA130710-K-CA

Except where noted, no residues were detected in the untreated control samples. DBP = days before planting.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Table 19 Residues of fluensulfone in mizuna

Location, Year (variety)	Application					Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
Frenchtown, PA, USA, 2013 (Mizuna)	1	30 DBP, Broadcast pre-plant incorporation	4.12	250	70	< 0.01 (< 0.01, < 0.01)	1.7 (1.6, 1.7)	0.54 (0.51, 0.57)	0.83 (0.78, 0.87)	AA130710-M-PA
High Springs, FL, USA, 2013 (Leafy Asian Greens)	1	32 DBP, Broadcast pre-plant incorporation	4.15	220	70	< 0.01 (< 0.01, < 0.01)	3.8 (4.3, 3.4)	0.50 (0.58, 0.42)	0.77 (0.89, 0.64)	AA130710-M-FL
Bagley, IA, USA, 2013 (Mizuna)	1	32 DBP, Drip irrigation	3.98	9000	90	< 0.01 (< 0.01, 0.004)	13 (13, 13) c0.006	5.2 (4.5, 5.9)	8.0 (6.9, 9.1)	AA130710-M-IA
Porterville, CA, USA, 2013 (Early Mizuna)	1	30 DBP, Drip irrigation	4.00	9100	73	< 0.01 (< 0.01, < 0.01)	1.8 (1.9, 1.8)	0.85 (0.96, 0.75)	1.3 (1.5, 1.2)	AA130710-M-CA

Except where noted, no residues were detected in the untreated control samples. DBP = days before planting.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Mustard greens

Five trials in mustard greens were conducted in the USA (Jones, 2015-b). Three of the trials were conducted using broadcast application to bare soil followed by incorporation into the soil, with the other trials involving application by drip irrigation. A single application of a 480 g/L EC fluensulfone formulation was made approximately 30 days before transplanting. All trials were conducted as single point trials, with a single control and duplicate treated samples being collected at harvest maturity. Samples were analysed for residues of parent compound and the metabolites TSA and BSA using a method based on method number 1977W. Acceptable concurrent recovery data was provided. Analyses were completed within 4 months of sample collection.

Table 20 Residues of fluensulfone in mustard greens

Location, Year (variety)	Application					Residues, mg /kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
Seven Springs, NC, USA, 2013 (Tendergreen)	1	28 DBS, Drip irrigation	4.13	9300	62	< 0.01 (< 0.01, < 0.01)	1.6 (1.4, 1.9)	4.2 (3.6, 4.9)	6.5 (5.5, 7.5)	AA130705-MG-NC
Cheneyville,	1	30 DBS,	4.17	300	64	< 0.01	1.4 (1.4,	0.074	0.11 (0.14,	AA13070

Location, Year (variety)	Application					Residues, mg /kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
LA, USA, 2013 (Florida Broadleaf)		Broadcast pre-plant incorporation				(< 0.01, < 0.01)	1.3)	(0.090, 0.058)	0.089)	5-MG-LA
Delevan, WI, USA, 2013 (Tendergreen)	1	Broadcast pre-plant incorporation	3.98	210	15	< 0.01 (< 0.01, < 0.01)	3.2 (3.3, 3.1)	0.10 (0.11, 0.10)	0.16 (0.17, 0.18)	AA130705-MG-WI
Uvalde, TX, USA, 2013 (India)	1	30 DBS, Broadcast pre-plant incorporation	3.97	230	92	< 0.01 (0.004, < 0.01)	2.2 (2.1, 2.2)	3.0 (2.9, 3.1)	4.6 (4.5, 4.8)	AA130705-MG-TX
Paso Robles, CA, USA, 2013 (Mizuna)	1	30 DBS, Drip irrigation	3.99	9000	66	< 0.01 (< 0.01, < 0.01)	2.6 (2.1, 3.1)	3.9 (3.0, 4.9)	6.1 (4.6, 7.5)	AA130705-MG-CA

No residues above the LOQ were found in any of the untreated control samples. DBS = days before sowing.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Radish leaves

Four trials in radish were conducted in the USA (Jones, 2014-c). A single dry broadcast application of a 150 g/kg granular fluensulfone formulation was made to the bare soil at each site, with incorporation into the approximately 7 days before sowing. Two trials were conducted as single point trials, with a single control and duplicate treated samples being collected at harvest maturity. The other two trials were conducted as decline trials, with additional duplicate treated samples being collected at intervals after scheduled commercial harvest. Samples were analysed for residues of parent compound and the metabolites TSA and BSA using a method based on method number 1977W. Acceptable concurrent recovery data was provided. Analyses were completed within 4 months of sample collection.

Table 21 Residues of fluensulfone in radish leaves (tops)

Location, Year (variety)	Application			Residues, mg/kg					Reference
	No.	Timing, type	Rate, kg ai/ha	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
North Rose, NY, USA, 2013 (Champion)	1	7 DBS	4.02	38	< 0.01 (< 0.01, < 0.01)	0.71 (0.70, 0.72)	1.1 (1.1, 1.2)	1.7 (1.7, 1.8)	AA130709-NY
High Springs, GA, USA, 2013 (Crunchy Royale)	1	7 DBS	4.10	46	< 0.01 (< 0.01, < 0.01)	3.4 (2.6, 4.2) c0.005	4.5 (3.0, 6.0)	6.9 (4.6, 9.2)	AA130709-GA
				49	< 0.01 (< 0.01, < 0.01)	2.4 (2.9, 2.0)	2.9 (3.3, 2.5)	4.4 (5.1, 3.8)	
				53	< 0.01 (< 0.01, < 0.01)	3.5 (3.5, 3.6)	3.9 (3.4, 4.5)	6.1 (5.2, 6.9)	
				55	< 0.01 (< 0.01, < 0.01)	2.7 (2.5, 3.0)	2.8 (2.7, 2.9)	4.3 (4.1, 4.4)	
Thonotosassa, FL, USA, 2013 (Diego)	1	7 DBS	4.09	37	< 0.01 (< 0.01, < 0.01)	1.5 (1.6, 1.5)	0.97 (0.97, 0.96)	1.5 (1.5, 1.5)	AA130709-FL
Porterville, CA, USA, 2013 (Crimson Giant)	1	7 DBS	4.03	37	< 0.01 (< 0.01, < 0.01)	5.4 (6.6, 4.1)	9.0 (8.7, 9.3)	14 (13, 14)	AA130709-CA

Location, Year (variety)	Application			Residues, mg/kg					Reference
	No.	Timing, type	Rate, kg ai/ha	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
				40	< 0.01 (< 0.01, < 0.01)	6.8 (7.7, 5.9)	9.2 (11, 7.4)	14 (17, 11)	
				43	< 0.01 (< 0.01, < 0.01)	9.2 (11, 7.4)	12 (15, 10)	19 (23, 15)	
				46	< 0.01 (< 0.01, < 0.01)	8.5 (8.0, 8.9)	14 (13, 15)	21 (20, 23)	

All residues in untreated control samples were <LOQ, and except where noted, were also <LOD. DBS = days before sowing.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Japanese root vegetable (Japanese radish/daikon and turnip) leaves

Four trials in each of Japanese radish (daikon) and turnip were conducted using a 480 g/L EC formulation of fluensulfone in the USA (Jones, 2014-d). Two trials in each crop employed broadcast soil application using hand held equipment, with the other two employing application by drip irrigation. A single application was made at each site approximately 30 days before sowing the crop. All trials were conducted as single point residue studies, with a single control and duplicate treated samples being collected at normal commercial harvest. Samples were analysed for residues of parent compound and the metabolites TSA and BSA using a method based on method number 1977W. Acceptable concurrent recovery data was provided. Analyses were completed within 6 months of sample collection.

Table 22 Residues of fluensulfone in Japanese radish leaves

Location, Year (variety)	Application				Residues, mg/kg					Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
Frenchtown, PA, USA, 2013 (Miyashige)	1	28 DBS, Drip irrigation	4.00	2720	84	< 0.01 (< 0.01, < 0.01)	1.5 (1.5, 1.5) c0.006	0.27 (0.30, 0.25)	0.42 (0.46, 0.38)	AA130711-WR-PA
Cheneyville, LA, USA, 2013 (White Icicle)	1	30 DBS, Pre-plant broadcast	4.26	300	64	< 0.01 (< 0.01, < 0.01)	1.5 (1.6, 1.4)	0.022 (0.027, 0.017)	0.034 (0.041, 0.026)	AA130711-WR-LA
Bagley, IA, USA, 2013 (Daikon Long)	1	29 DBS, Drip irrigation	3.97	9020	85	< 0.01 (< 0.01, < 0.01)	16 (16, 16) c0.015	2.8 (2.8, 2.9)	4.4 (4.3, 4.4)	AA130711-WR-IA
Uvalde, TX, USA, 2013 (Hybrid Radish Minowase Summer Cross #3)	1	28 DBS, Pre-plant broadcast	4.03	220	91	< 0.01 (< 0.01, < 0.01)	2.1 (2.3, 2.0)	1.2 (1.4, 1.1)	1.9 (2.1, 1.7)	AA130711-WR-TX

Except where noted, no residues were detected in any of the untreated control samples. DBS = days before sowing.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Table 23 Residues of fluensulfone in turnip leaves

Location, Year (variety)	Application				Residues, mg/kg					Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
Chula, GA, USA,	1	32 DBS, Drip	4.02	9030	115	< 0.01	0.047	0.91	1.4 (1.3,	AA13071

Location, Year (variety)	Application				Residues, mg/kg					Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total[a]	
2013/14 (Purple Top White Globe)		irrigation				(< 0.01, < 0.01)	(0.047, 0.047)	(0.87, 0.96)	1.5)	1-T-GA
Washington, LA, USA, 2013/14 (Purple Top White Globe)	1	30 DBS, Pre-plant broadcast	3.98	230	111	< 0.01 (< 0.01, < 0.01)	0.36 (0.44, 0.28)	0.023 (0.032, 0.015)	0.036 (0.049, 0.023)	AA13071 1-T-LA
Richland, IA, USA, 2013 (Purple Top White Globe OG)	1	33 DBS, Drip irrigation	3.97	10600	83	< 0.01 (< 0.01, < 0.01)	0.69 (0.48, 0.89)	0.35 (0.23, 0.46)	0.53 (0.35, 0.71)	AA13071 1-T-IA
Hinton, OK, USA, 2013 (Purple Top)	1	31 DBS, Pre-plant broadcast	3.99	220	92	< 0.01 (< 0.01, < 0.01)	3.9 (3.9, 3.9)	3.1 (3.3, 2.9)	4.8 (5.1, 4.4)	AA13071 1-T-OK

No residues were detected in any of the untreated control samples. DBS = days before sowing.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Root and tuber vegetables

Carrot

A series of residue trials in carrots was conducted in the USA and Canada as part of the IR-4 program (Lennon, 2015-a). A single dry broadcast application of a 150 g/kg granular fluensulfone formulation was made to the bare soil at each site, with incorporation into the approximately 7 days before planting. All trials were conducted as single point trials, with a single control and duplicate treated samples being collected at harvest maturity. Samples were analysed for residues of parent compound and the metabolites TSA and BSA using a method based on method number 1977W. Acceptable concurrent recovery data was provided. Analyses were completed within 18 months of sample collection.

The two trials conducted at Harrow, ON (trial numbers 12-ON12 and 12-ON13) were not considered to be independent, as the treatments were applied on the same day at both sites.

Table 24 Residues of fluensulfone in carrot

Location, Year (variety)	Application				Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	PHI, days	Fluensulfone	TSA	BSA	Total [a]	
Citra, FL, USA, 2012 (Nelson)	1	7 DBP, Pre-plant soil incorporation	4.04	82	0.20 (0.19, 0.21)	0.050 (0.053, 0.048)	0.32 (0.30, 0.33)	0.68 (0.65, 0.72)	10907 12-FL25
Weslaco, TX, USA, 2013/13 (Sugar Snax 54)	1	6 DBP, Pre-plant soil incorporation	4.04	112	0.26 (0.28, 0.24)	0.19 (0.18, 0.19)	0.35 (0.42, 0.28)	0.80 (0.92, 0.67)	10907 12-TX20
Holtville, CA, USA, 2012/13 (Topcut 93)	1	7 DBP, Pre-plant soil incorporation	4.03	134	0.47 (0.46, 0.49)	0.15 (0.14, 0.16)	1.1 (1.0, 1.2)	2.2 (2.0, 2.3)	10907 12-CA51
Riverside, CA, USA, 2012 (Sugar Snax 54 F1)	1	7 DBP, Pre-plant soil incorporation	4.04	91	0.49 (0.50, 0.49)	0.56 (0.59, 0.53)	0.66 (0.68, 0.65)	1.5 (1.5, 1.5)	10907 12-CA52
Las Cruces, NM, USA, 2012 (Danvers)	1	6 DBP, Pre-plant soil incorporation	4.04	110	0.12 (0.17, 0.082)	0.11 (0.14, 0.073)	0.43 (0.58, 0.28)	0.79 (1.1, 0.51)	10907 12-NM07
Willard, OH, USA, 2012 (Maverick)	1	6 DBP, Pre-plant soil incorporation	4.05	125	< 0.01 (0.008, 0.004)	0.15 (0.18, 0.12)	0.055 (0.073, 0.038)	0.091 (0.12, 0.062)	10907 12-OH08

Location, Year (variety)	Application				Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	PHI, days	Fluensulfone	TSA	BSA	Total [a]	
Salinas, CA, USA, 2012 (Laguna)	1	7 DBP, Pre-plant soil incorporation	4.03	88	0.058 (0.051, 0.065)	0.80 (0.73, 0.87)	0.34 (0.30, 0.38)	0.58 (0.51, 0.65)	10907 12-CA53
Moxee, WA, USA, 2012 (Hilmar)	1	6 DBP, Pre-plant soil incorporation	4.01	112	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	10907 12-WA21
Kentville, NS, Canada, 2012 (Napoli)	1	6 DBP, Pre-plant soil incorporation	4.00	89	0.17 (0.18, 0.16)	0.17 (0.16, 0.19)	0.26 (0.26, 0.25)	0.56 (0.58, 0.54)	10907 12-NS03
Harrow, ON, Canada, 2012 (Dominion)	1	8 DBP, Pre-plant soil incorporation	4.01	76	0.098 (0.078, 0.12)	0.12 (0.10, 0.13)	0.086 (0.075, 0.098)	0.23 (0.19, 0.27)	10907 12-ON12
Harrow, ON, Canada, 2012 (Envy)	1	8 DBP, Pre-plant soil incorporation	4.00	76	0.10 (0.14, 0.073)	0.16 (0.19, 0.13)	0.12 (0.17, 0.074)	0.29 (0.40, 0.19)	10907 12-ON13
Ste Clotilde, QC, Canada, 2012 (Hybrid Bastia)	1	7 DBP, Pre-plant soil incorporation	4.20	90	0.050 (0.057, 0.042)	0.32 (0.34, 0.29)	0.18 (0.18, 0.18)	0.33 (0.33, 0.32)	10907 12-QC07

No residues were detected in any of the untreated control samples. DBP = days before planting.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Potato

A series of residue trials in potatoes was conducted in the USA and Canada as part of the IR-4 program (Lennon, 2015-b). A single dry broadcast application of a 150 g/kg granular fluensulfone formulation was made to the bare soil at each site, with incorporation into the soil, on the day of, or a few days before planting. Most trials were conducted as single point trials, with a single control and duplicate treated samples being collected at harvest maturity, while two were decline trials. One trial was conducted as a processing study; its results will be discussed in the appropriate section below. Samples were analysed for residues of parent compound and the metabolites TSA and BSA using a method based on method number 1977W. Generally acceptable concurrent recovery data was provided, although it is noted that some of the individual recoveries and the mean value for BSA fortified at 0.01 mg/kg were slightly below the range 70-120%. Analyses were completed within 23 months of sample collection. A concurrently conducted storage stability study confirmed that residue of fluensulfone and its metabolites were stable over the period of sample storage.

One pair of trials at Moxee, WA, USA (trial numbers 12-WA*19 and 12-WA*20, applications of the same day), and three pairs of trials in Canada (trial numbers 12-AB02 and 12-AB03 at Taber, AB, applications 1 day apart; trial numbers 12-NB01 and 12-NB02 at Bouchtouche, NB, applications on the same day; and trial numbers 12-SK01 and 12-SK02 at Scott, SK, applications 1 day apart) were not considered to be independent given that the applications were conducted less than 1 month apart.

Table 25 Residues of fluensulfone in potato tubers

Location, Year (variety)	Application				Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	PHI, days	Fluensulfone	TSA	BSA	Total [a]	
Wooster, OH, USA, 2012 (Norland)	1	0 DBP, Pre-plant soil incorporation	4.02	80	< 0.01 (< 0.01, < 0.01)	0.091 (0.090, 0.092)	0.13 (0.14, 0.12)	0.20 (0.21, 0.18)	10904 12-OH*07

Location, Year (variety)	Application				Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	PHI, days	Fluensulfone	TSA	BSA	Total [a]	
Moxee, WA, USA, 2012 (Russett)	1	0 DBP, Pre-plant soil incorporation	4.04	134	< 0.01 (< 0.01, < 0.01)	0.051 (0.054, 0.048)	0.047 (0.049, 0.044)	0.071 (0.075, 0.068)	10904 12-WA*19
Moxee, WA, USA, 2012 (Yukon Gold)	1	0 DBP, Pre-plant soil incorporation	4.04	114	< 0.01 (< 0.01, < 0.01)	0.039 (0.030, 0.048)	0.099 (0.085, 0.11)	0.15 (0.13, 0.17)	10904 12-WA*20
Parlier, CA, USA, 2012 (Russett Norkotah 296)	1	0 DBP, Pre-plant soil incorporation	4.04	140	< 0.01 (< 0.01, < 0.01)	0.10 (0.14, 0.068)	0.19 (0.28, 0.11)	0.30 (0.43, 0.17)	10904 12-CA50
Parma, ID, USA, 2012 (Ranger Russett)	1	4 DBP, Pre-plant soil incorporation	4.03	134	< 0.01 (< 0.01, < 0.01)	0.16 (0.14, 0.18)	0.083 (0.077, 0.090)	0.13 (0.12, 0.14)	10904 12-ID11
Kimberly, ID, USA, 2012 (Russett Burbank)	1	0 DBP, Pre-plant soil incorporation	4.03	148	< 0.01 (< 0.01, < 0.01)	0.027 (0.027, 0.027)	0.067 (0.064, 0.070)	0.10 (0.098, 0.11)	10904 12-ID12
Las Cruces, NM, USA, 2012 (Yukon Gold)	1	0 DBP, Pre-plant soil incorporation	4.04	105	< 0.01 (< 0.01, < 0.01)	0.040 (0.048, 0.032)	0.057 (0.073, 0.041)	0.087 (0.11, 0.062)	10904 12-NM06
Prosser, WA, USA, 2012 (Yukon Gold)	1	0 DBP, Pre-plant soil incorporation	4.24	80	< 0.01 (< 0.01, < 0.01)	0.13 (0.14, 0.12)	0.33 (0.36, 0.31)	0.51 (0.55, 0.48)	10904 12-WA18
				87	< 0.01 (< 0.01, < 0.01)	0.10 (0.11, 0.097)	0.26 (0.26, 0.26)	0.40 (0.40, 0.40)	
				94	< 0.01 (< 0.01, < 0.01)	0.11 (0.11, 0.11)	0.26 (0.26, 0.26)	0.40 (0.40, 0.40)	
Salisbury, MD, USA, 2012 (Kennebec)	1	0 DBP, Pre-plant soil incorporation	4.04	110	< 0.01 (< 0.01, < 0.01)	0.45 (0.31, 0.58)	0.099 (0.075, 0.12)	0.15 (0.12, 0.18)	10904 12-MD11
Freeville, NY, USA, 2012 (Yukon Gold)	1	0 DBP, Pre-plant soil incorporation	4.04	112	< 0.01 (< 0.01, < 0.01)	0.040 (0.044, 0.035)	0.095 (0.10, 0.090)	0.15 (0.15, 0.14)	10904 12-NY09
Hancock, WI, USA, 2012 (Russett Burbank)	1	0 DBP, Pre-plant soil incorporation	4.04	110	< 0.01 (< 0.01, < 0.01)	0.073 (0.061, 0.085)	0.054 (0.038, 0.071)	0.084 (0.058, 0.11)	10904 12-WI08
Citra, FL, USA, 2012 (Red Pontiac)	1	0 DBP, Pre-plant soil incorporation	4.04	74	< 0.01 (< 0.01, < 0.01)	0.096 (0.11, 0.083)	0.18 (0.18, 0.18)	0.28 (0.28, 0.28)	10904 12-FL24
Taber, AB, Canada, 2013 (Yukon Gold)	1	0 DBP, Pre-plant soil incorporation	4.33	111	< 0.01 (< 0.01, < 0.01)	0.044 (0.048, 0.040)	0.099 (0.10, 0.093)	0.15 (0.15, 0.14)	10904 12-AB02
Taber, AB, Canada, 2013 (Sangre)	1	0 DBP, Pre-plant soil incorporation	4.02	110	< 0.01 (< 0.01, < 0.01)	0.11 (0.10, 0.12)	0.13 (0.12, 0.13)	0.19 (0.18, 0.20)	10904 12-AB03
Bouchtouche, NB, Canada, 2012 (Yukon Gold)	1	0 DBP, Pre-plant soil incorporation	4.00	110	< 0.01 (< 0.01, < 0.01)	0.13 (0.16, 0.098)	0.31 (0.42, 0.21)	0.48 (0.64, 0.32)	10904 12-NB01
Bouchtouche, NB, Canada, 2012 (Russett Norkotah)	1	0 DBP, Pre-plant soil incorporation	3.99	115	< 0.01 (< 0.01, < 0.01)	0.090 (0.090, 0.091)	0.20 (0.17, 0.22)	0.30 (0.26, 0.34)	10904 12-NB02
Sheffield Mills, NS, Canada, 2012 (Superior)	1	0 DBP, Pre-plant soil incorporation	4.19	71	< 0.01 (< 0.01, < 0.01)	0.12 (0.11, 0.13)	0.27 (0.24, 0.29)	0.41 (0.37, 0.44)	10904 12-NS01
Kentville, NS, Canada, 2012 (Dakota Pearl)	1	1 DBP, Pre-plant soil incorporation	4.19	78	< 0.01 (< 0.01, < 0.01)	0.088 (0.083, 0.094)	0.075 (0.074, 0.077)	0.12 (0.11, 0.12)	10904 12-NS02
Delhi, ON, Canada, 2013 (Envol)	1	0 DBP, Pre-plant soil	4.00	75	< 0.01 (< 0.01,	0.10 (0.11,	0.11 (0.11,	0.17 (0.17,	10904 12-

Location, Year (variety)	Application				Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	PHI, days	Fluensulfone	TSA	BSA	Total [a]	
		incorporation			< 0.01)	0.099)	0.11)	0.17)	ON11
Ste Clotilde, QC, Canada, 2012 (Kennebec)	1	0 DBP, Pre-plant soil incorporation	4.20	87	< 0.01 (< 0.01, < 0.01)	0.035 (0.036, 0.033)	0.070 (0.070, 0.070)	0.11 (0.11, 0.11)	10904 12-QC06
Scott, SK, Canada, 2012 (Yukon Gold)	1	0 DBP, Pre-plant soil incorporation	4.20	113	< 0.01 (< 0.01, < 0.01)	0.033 (0.032, 0.035)	0.11 (0.10, 0.12)	0.17 (0.15, 0.18)	10904 12-SK01
Scott, SK, Canada, 2012 (Norland D)	1	0 DBP, Pre-plant soil incorporation	4.20	86	< 0.01 (< 0.01, < 0.01)	0.030 (0.032, 0.029)	0.078 (0.070, 0.086)	0.12 (0.11, 0.13)	10904 12-SK02
				93	< 0.01 (< 0.01, < 0.01)	0.029 (0.030, 0.027)	0.064 (0.067, 0.060)	0.097 (0.10, 0.092)	
				100	< 0.01 (< 0.01, < 0.01)	0.029 (0.026, 0.032)	0.057 (0.048, 0.066)	0.087 (0.074, 0.10)	

All residues in untreated control samples were <LOQ. DBP = days before planting.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Radish

Four trials in radish were conducted in the USA (Jones, 2014-c). A single dry broadcast application of a 150 g/kg granular fluensulfone formulation was made to the bare soil at each site, with incorporation into the approximately 7 days before sowing. Two trials were conducted as single point trials, with a single control and duplicate treated samples being collected at harvest maturity. The other two trials were conducted as decline trials, with additional duplicate treated samples being collected at intervals after scheduled commercial harvest. Samples were analysed for residues of parent compound and the metabolites TSA and BSA using a method based on method number 1977W. Acceptable concurrent recovery data was provided. Analyses were completed within 4 months of sample collection.

Table 26 Residues of fluensulfone in radish roots

Location, Year (variety)	Application			Residues, mg/kg					Reference
	No.	Timing	Rate, kg ai/ha	PHI, days	Fluensulfone	TSA	BSA	Total [a]	
North Rose, NY, USA, 2013 (Champion)	1	7 DBS	4.02	38	< 0.01 (< 0.01, < 0.01)	0.090 (0.081, 0.099)	0.18 (0.13, 0.23)	0.28 (0.20, 0.35)	AA130709-NY
High Springs, GA, USA, 2013 (Crunchy Royale)	1	7 DBS	4.10	46	< 0.01 (< 0.01, < 0.01)	0.15 (0.12, 0.19)	0.23 (0.16, 0.30)	0.35 (0.25, 0.46)	AA130709-GA
				49	< 0.01 (< 0.01, < 0.01)	0.10 (0.076, 0.13)	0.14 (0.12, 0.17)	0.22 (0.18, 0.26)	
				53	< 0.01 (< 0.01, < 0.01)	0.16 (0.16, 0.17)	0.20 (0.19, 0.20)	0.30 (0.29, 0.31)	
				55	< 0.01 (< 0.01, < 0.01)	0.16 (0.14, 0.17)	0.18 (0.17, 0.18)	0.27 (0.26, 0.28)	
Thonotosassa, FL, USA, 2013 (Diego)	1	7 DBS	4.09	37	< 0.01 (< 0.01, < 0.01)	0.093 (0.097, 0.088)	0.080 (0.080, 0.079)	0.12 (0.12, 0.12)	AA130709-FL
Porterville, CA, USA, 2013 (Crimson Giant)	1	7 DBS	4.03	37	< 0.01 (< 0.01, 0.006)	0.76 (0.90, 0.61)	1.4 (1.2, 1.5)	2.1 (1.8, 2.3)	AA130709-CA

Location, Year (variety)	Application			Residues, mg/kg					Reference
	No.	Timing	Rate, kg ai/ha	PHI, days	Fluensulfone	TSA	BSA	Total [a]	
				40	< 0.01 (< 0.01, 0.004)	0.68 (0.81, 0.54)	1.1 (1.2, 1.1)	1.8 (1.8, 1.7)	
				43	< 0.01 (< 0.01, < 0.01)	0.88 (0.95, 0.80)	1.5 (1.6, 1.4)	2.3 (2.5, 2.1)	
				46	< 0.01 (< 0.01, < 0.01)	0.79 (0.68, 0.90)	1.9 (1.5, 2.2)	2.8 (2.3, 3.4)	

No residues were detected in any of the untreated control samples. DBS = days before sowing.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Japanese radish and turnip

Four trials in each of Japanese radish (daikon) and turnip were conducted using a 480 g/L EC formulation of fluensulfone in the USA (Jones, 2014-d). Two trials in each crop employed broadcast soil application using hand held equipment, with the other two employing application by drip irrigation. A single application was made at each site approximately 30 days before sowing the crop. All trials were conducted as single point residue studies, with a single control and duplicate treated samples being collected at normal commercial harvest. Samples were analysed for residues of parent compound and the metabolites TSA and BSA using a method based on method number 1977W. Acceptable concurrent recovery data was provided. Analyses were completed within 6 months of sample collection.

Table 27 Residues of fluensulfone in Japanese radish roots

Location, Year (variety)	Application				Residues, mg/kg					Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total [a]	
Frenchtown, PA, USA, 2013 (Miyashige)	1	28 DBS, Drip irrigation	4.00	2720	84	< 0.01 (< 0.01, < 0.01)	0.18 (0.19, 0.17)	0.030 (0.033, 0.027)	0.046 (0.050, 0.041)	AA130711-WR-PA
Cheneyville, LA, USA, 2013 (White Icicle)	1	30 DBS, Pre-plant broadcast	4.26	300	64	< 0.01 (< 0.01, < 0.01)	0.23 (0.25, 0.21)	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	AA130711-WR-LA
Bagley, IA, USA, 2013 (Daikon Long)	1	29 DBS, Drip irrigation	3.97	9020	85	< 0.01 (< 0.01, < 0.01)	0.93 (0.98, 0.87)	0.17 (0.19, 0.16)	0.27 (0.29, 0.25)	AA130711-WR-IA
Uvalde, TX, USA, 2013 (Hybrid Radish Minowase Summer Cross #3)	1	28 DBS, Pre-plant broadcast	4.03	220	91	< 0.01 (< 0.01, < 0.01)	0.15 (0.19, 0.12)	0.13 (0.16, 0.10)	0.20 (0.25, 0.15)	AA130711-WR-TX

No residues were detected in any of the untreated control samples. DBS = days before sowing.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Table 28 Residues of fluensulfone in turnip roots

Location, Year (variety)	Application				Residues, mg/kg					Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total [a]	
Chula, GA, USA, 2013/14 (Purple Top White Globe)	1	32 DBS, Drip irrigation	4.02	9030	115	< 0.01 (< 0.01, < 0.01)	< 0.01 (0.003, 0.004)	0.072 (0.067, 0.076)	0.11 (0.10, 0.12)	AA130711-T-GA
Washington, LA, USA, 2013/14 (Purple Top White Globe)	1	30 DBS, Pre-plant broadcast	3.98	230	111	< 0.01 (< 0.01, < 0.01)	0.026 (0.021, 0.032)	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	AA130711-T-LA
Richland, IA, USA, 2013 (Purple Top White Globe OG)	1	33 DBS, Drip irrigation	3.97	10600	83	< 0.01 (< 0.01, < 0.01)	0.099 (0.070, 0.13)	0.050 (0.037, 0.063)	0.077 (0.057, 0.097)	AA130711-T-IA
Hinton, OK, USA, 2013 (Purple Top)	1	31 DBS, Pre-plant broadcast	3.99	220	92	< 0.01 (0.005, 0.004)	0.53 (0.57, 0.49)	0.37 (0.41, 0.34)	0.58 (0.63, 0.53)	AA130711-T-OK

No residues were detected in any of the untreated control samples. DBS = days before sowing.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

Celery

Six trials were conducted in celery in the USA (Jones, 2015-b). Three of the trials employed broadcast application using tractor mounted or handheld equipment (e.g. backpack sprayers) to bare soil followed by incorporation into the soil, with the other trials involving application to bare soil by drip irrigation. A single application of a 480 g/L EC fluensulfone formulation was made approximately 7 days before sowing or transplanting. Most of the trials were single point residue trials, with one control and duplicate treated samples being collected at commercial harvest. One trial was conducted as a decline trial, with additional duplicate treated samples being collected at intervals a few days either side of scheduled commercial harvest. Samples were analysed for residues of parent compound and the metabolites TSA and BSA using a method based on method number 1977W. Acceptable concurrent recovery data was provided. Analyses were completed within 5 months of sample collection.

Table 29 Residues of fluensulfone in celery

Location, Year (variety)	Application					Residues, mg/kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total [a]	
Hobe Sound, FL, USA, 2013/14 (Walts Pride)	1	7 DBT, Drip irrigation	4.02	9100	78	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.01 (< 0.01, < 0.01)	< 0.015 (< 0.015, < 0.015)	AA130706-CE-FL
Sparta, MI, USA, 2013 (Greenbay)	1	8 DBT, Broadcast pre-plant	3.95	250	103	0.087 (0.090, 0.084)	0.85 (0.86, 0.85)	0.17 (0.19, 0.16)	0.36 (0.38, 0.33)	AA130706-CE-MI

Location, Year (variety)	Application					Residues, mg /kg				Reference
	No.	Timing, type	Rate, kg ai/ha	Spray volume (L/ha)	PHI, days	Fluensulfone	TSA	BSA	Total [a]	
		incorporation								
					106	0.077 (0.079, 0.074)	0.89 (0.57, 1.2)	0.16 (0.14, 0.18)	0.32 (0.29, 0.35)	
					109	0.056 (0.051, 0.061)	0.90 (0.62, 1.2)	0.13 (0.11, 0.14)	0.25 (0.22, 0.28)	
					112	0.067 (0.056, 0.078)	0.92 (1.0, 0.84)	0.14 (0.11, 0.18)	0.29 (0.22, 0.35)	
Arroyo Grande, CA, USA, 2013 (Conquistador)	1	8 DBT, Broadcast pre-plant incorporation	4.18	300	104	0.028 (0.031, 0.025)	0.049 (0.051, 0.047)	0.059 (0.059, 0.059)	0.12 (0.12, 0.12)	AA130706-CE-CA-1
King City, CA, USA, 2013 (Conquistador)	1	7 DBT, Drip irrigation	4.00	9100	99	0.52 (0.49, 0.55)	0.029 (0.027, 0.031)	0.33 (0.28, 0.38)	1.0 (0.92, 1.1)	AA130706-CE-CA-2
Guadalupe, CA, USA, 2013 (Conquistador)	1	7 DBT, Broadcast pre-plant incorporation	3.96	300	104	0.13 (0.13, 0.14)	0.54 (0.48, 0.60)	0.32 (0.29, 0.36)	0.63 (0.57, 0.69)	AA130706-CE-CA-3
Porterville, CA, USA, 2013 (Mission)	1	7 DBT, Drip irrigation	4.01	9100	96	0.36 (0.32, 0.40)	0.18 (0.14, 0.23)	0.27 (0.25, 0.30)	0.78 (0.70, 0.86)	AA130706-CE-CA-4

No residues were detected in any of the untreated control samples. DBT = days before transplanting.

[a] Sum of fluensulfone and BSA, expressed as fluensulfone.

FATE OF RESIDUES IN PROCESSING

Potato

Potato tubers for processing were grown at a single site in the USA (Lennon, 2015-b) as part of the same series of field trials in the potato residue study. A single pre-planting application of a 150 g/kg granular fluensulfone formulation was applied to soil at a target rate of 8.08 kg ai/ha. A single large sample of potatoes was collected from each of the control and treated plots.

Processing samples of potatoes were processed using simulated commercial processes into dried potato flakes, chips and wet peel. Potato samples were first tub washed for 5 minutes, then inspected to remove stones and potato culls.

For generation of potato flake and wet peel samples, an aliquot of the washed potatoes were then steam peeled in a pilot scale pressure steam peeler at 100–120 psi for 45–60 seconds. The potatoes are then scrubbed in batches using a restaurant peeler equipped with a rubber scrubber for 15–30 seconds. Peel was collected. Peeled potatoes were then inspected and hand trimmed to remove damaged, rotten or green tissue. Collected peel was pressed to reduce the water content, combined with trimmings, and a sample of the combined peel/trimmings collected to form the wet peel sample and frozen. The trimmed potatoes were then sliced (1.0–1.5 cm slices) using a restaurant style food cutter. Sliced potatoes were batch spray washed for 30 seconds in cold water to remove free starch from the surfaces of the slices. Potato slices were precooked at 70–77 ºC for approximately 20 minutes in a steam jacketed kettle. Precooked potato slices were cooled below 32 ºC using cold running tap water. The cooled potato slices were then steam cooked at 94–100 ºC for approximately

40 minutes using an atmospheric pressure steam cooker. The cooked slices were then mashed using a restaurant style meat grinder. Mashed potatoes were then mixed with the required additives in a bakery style mixer for 60 seconds. The mash was hand fed onto a laboratory scale single drum dryer and dried into a single sheet. The potato sheet was broken up into large pieces by hand and fed into a hammer mill to reduce the flakes to a uniform size. The water content was tested and dried on a fluidised bed drier to ≤ 9% moisture. A sample of the dried potato flakes was collected for analysis and frozen.

A second aliquot of the washed and culled potatoes was processed into potato chips. The washed potatoes were first peeled using an abrasive peeler. The peel was weighed and discarded. The peeled potatoes were then inspected and trimmed by hand with a knife to remove rotten, damaged or green areas. The trimmings were weighed and discarded. Using a restaurant cutter/slicer, chips were cut at a ~0.16 cm thickness. Free starch was rinsed from the surface of the chips using a tub of hot tap water. The chips were cooked using a restaurant deep fat fryer at 163–191 ºC for 60–90 seconds. The cooked chips were drained of excess oil on a tray, salted, inspected to remove any undesirable chips and a sample collected for analysis and frozen.

Residues of fluensulfone, TSA and BSA were determined using LC-MS/MS number 1977W. With the exception of fluensulfone from potato chips, recoveries were within the range 70–120%. However, consistent mean recoveries (57–67%) were achieved across the three fortification levels for potato chips. Processed potato commodities were analysed within 26 months of sample generation. The storage stability data demonstrated stability of residues of fluensulfone, TSA and BSA in potato flakesand wet peel, and for TSA and BSA in chips, for 25 months. Recoveries of fluensulfone parent compound from chips after 25 months storage were below 70% (57–62%), however these values were comparable with the method validation and concurrent recoveries. Furthermore, stability of fluensulfone parent compound in raw potato tubers was acceptable over 26 months, and no residues above LOQ were found in potato tubers. Hence, no residues of parent are expected in processed potato commodities.

Table 30 Residues of fluensulfone in processed potato commodities

Processed Fractions	Analyte	Residues mg/kg	Processing factor	Reference
Potato tubers (RAC)	Fluensulfone	< 0.01	-	Lennon, 2015-b, PR 10904
Potato flakes	Fluensulfone	< 0.01	-	
Potato chips	Fluensulfone	< 0.01	-	
Wet peel	Fluensulfone	< 0.01	-	
Potato tubers (RAC)	TSA	0.085	-	Lennon, 2015a, PR 10904
Potato flakes	TSA	0.139	1.6	
Potato chips	TSA	0.085	1.0	
Wet peel	TSA	0.042	0.5	
Potato tubers (RAC)	BSA	0.178	-	Lennon, 2015a, PR 10904
Potato flakes	BSA	0.436	2.4	
Potato chips	BSA	0.293	1.6	
Wet peel	BSA	0.056	0.3	

RESIDUES IN ANIMAL COMMODITIES

No animal feeding studies were supplied to the Meeting.

APPRAISAL

Fluensulfone was evaluated by JMPR for the first time for toxicology in 2013, when an ADI of 0–0.01 mg/kg bw/day and an ARfD of 0.3 mg/kg bw were established. At the 2014 JMPR, the residue aspects were evaluated, and a residue definition of *3,4,4-trifluorobut-3-ene-1-sulfonic acid (BSA)* was recommended for plant commodities, for enforcement and for dietary risk assessment. A residue

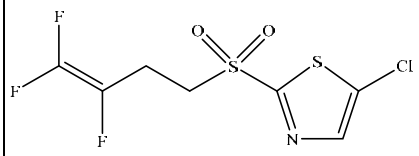
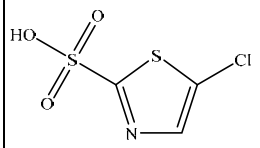
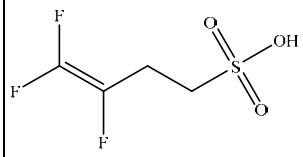
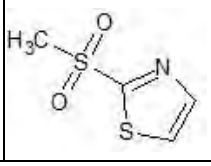
definition for animal commodities was not considered necessary. Maximum residue levels were estimated for fruiting vegetables, cucurbits, and fruiting vegetables, other than cucurbits, except sweet corn and mushrooms.

At the 47th Session of CCPR in 2015, fluensulfone was scheduled for evaluation by the 2016 JMPR for consideration of residue data for additional crops.

The Meeting received GAP information, supervised residue trials, processing studies, storage stability data and field rotational cropping trials.

The 2014 JMPR noted that based on the available residue data there was no reasonable expectation of finite residues of parent compound, and established a residue definition excluding parent compound. The current Meeting noted that residues of parent compound may occur in some of the additional crops for which supervised trial data was provided and that it was appropriate to revisit the decision on residue definition.

The following residue components are discussed. Structures and chemical names are tabulated below.

Common name/abbreviation	Chemical name	Structure	Molecular weight
Fluensulfone, MCW-2	5-Chloro-2-[(3,4,4-trifluorobut-3-en-1-yl)sulfonyl]thiazole		291.7
Thiazole sulfonic acid, TSA, M-3625	5-Chloro-thiazole-2-sulfonic acid		199.6
Butene sulfonic acid, BSA, M-3627	3,4,4-Trifluorobut-3-ene-1-sulfonic acid		190.1
MeS, M-3626	2-Methylsulfonylthiazole		131.2

Methods of analysis

Analytical methods for plant and animal commodities were evaluated by the 2014 JMPR. In the residue and storage stability studies provided to the current Meeting, residues of fluensulfone parent compound and its metabolites TSA and BSA were determined using an LC-MS/MS method (method number 1977W). This method was evaluated by the 2014 JMPR and considered to be acceptable. Suitable validation data was generated concurrently with each residue study.

Stability of pesticide residues in stored analytical samples

The stability of fluensulfone residues in tomato, capsicum, cucumber, melon, and tomato puree/paste was considered by the 2014 JMPR. Stability was demonstrated in raw tomatoes for 15 months, processed tomato commodities for 6 months, and in capsicum, cucumber and melon for 16 months.

The Meeting received stability data for residues of fluensulfone, including the metabolites BSA and TSA, in oranges, potatoes (including processed commodities) and carrots. Stability was

demonstrated over 18 months of frozen storage for oranges, over 17.5 months in carrots, over 23 months in potato tubers, and over 25 months in dried potatoes and wet peel.

Residues of TSA and BSA were stable in potato chips over 25 months, while residues of fluensulfone parent declined below 70% of the fortified level after storage. However, residues of fluensulfone parent were stable in raw potatoes and are not expected above the LOQ in raw potatoes, or in processed potato products.

Analyses were completed within timeframes verified by the stability studies for all residue studies considered by the Meeting, with the exception of some of the wheat grain, straw and hay samples from the 30-, 60- and 120-day plant back experiments in the rotational cropping study, which were analysed 32–34 months after collection. Results from these plant back intervals are not relied on in consideration of rotational crop residues.

Definition of the residue

In establishing residue definitions for fluensulfone the 2014 JMPR noted:

- Fluensulfone parent compound was not detected in commodities at harvest in the metabolism studies (potato, lettuce and tomato) or in supervised residue trials (in cucurbit and non-cucurbit fruiting vegetables), with the exception of a single low level in one sample. The 2014 JMPR concluded there was no reasonable expectation of residues of fluensulfone parent compound in plant commodities at harvest.
- BSA and TSA form the major components of the residue in plant metabolism studies and were the only significant residues at harvest in the fruiting vegetable supervised residue trials.
- With the exception of poultry fat, for which finite residues of parent were observed (0.009–0.041 mg eq/kg), and poultry liver in which TSA was found at 0.016 mg eq/kg, no residues of fluensulfone, BSA or TSA were detected in livestock products in metabolism studies. Radioactive residues were predominantly associated with natural products.
- TSA is not toxicologically significant.
- BSA and TSA are quantified in one analytical method with a separate analytical method required to quantify fluensulfone.

Based on the above, the 2014 JMPR established a residue definition of BSA for compliance and risk assessment purposes for plant commodities and a residue definition was not required for animal commodities. It was agreed that the ADI and ARfD for fluensulfone could be used for screening exposure to BSA.

Whilst it is not common practice for a residue definition to be changed except at a periodic review, the Meeting noted that new residue data provided indicates parent fluensulfone is a significant residue in a number of crops not previously evaluated. Furthermore, additional toxicological data are available for the key metabolite BSA. The Meeting therefore considered that the residue definitions for fluensulfone should be revisited.

In supervised trials provided to the Meeting, residues of fluensulfone parent were routinely observed in head lettuce, leaf lettuce, carrots, and celery, at levels of up to 0.017, 0.059, 0.49, and 0.52 mg/kg respectively. Correspondingly, residues of BSA in head lettuce, leaf lettuce, carrots and celery ranged up to 0.27, 0.88, 1.1, and 0.33 mg/kg. No residues of fluensulfone parent were observed in supervised trials provided to the Meeting for strawberries, Brassica vegetables, spinach, komatsuna, mizuna, mustard greens, potatoes, radish, Japanese radish or turnips.

The Meeting noted that the residue profile in the additional crops considered differs from those considered at the 2014 JMPR, with observations of fluensulfone at quantifiable levels. The Meeting considered that parent compounds of pesticides are routinely analysed for, in monitoring programmes. Suitable validated methods for determination of fluensulfone and BSA are available,

although multi-residue methods for fluensulfone and its metabolites have not been provided to the JMPR. The Meeting concluded that both parent compound and BSA should be included in the residue definition for enforcement in plant commodities.

Additional repeat dose toxicological data for BSA was received by the Meeting. Based on the more extensive, newly submitted 90-day toxicity study with BSA (M3627), the current Meeting concluded that BSA is significantly less toxic than fluensulfone over 90 days of dietary exposure in rats; on this basis, it was concluded that residues of BSA in plants or animals were unlikely to be of toxicological relevance.

Noting the advice from the WHO panel at the 2014 JMPR regarding TSA and at the current Meeting regarding BSA, only parent compound is of toxicological relevance. Therefore, the Meeting concluded that the residue definition for dietary risk assessment in plant commodities should be parent compound alone.

The Meeting noted that fluensulfone parent compound was observed in poultry fat in the laying hen metabolism study, at levels up to 0.041 mg eq/kg. BSA was not detected in any poultry matrices, while TSA was found only in liver at 0.016 mg eq/kg. No compounds specific to fluensulfone were identified in the lactating goat metabolism study.

The Meeting noted that finite residues of parent compound were observed in carrots, which are a minor feed commodity for mammalian and poultry livestock, resulting in a non-zero livestock dietary burden for fluensulfone. A validated method for determination of fluensulfone parent compound in animal commodities, with an LOQ of 0.01 mg/kg, was evaluated by the 2014 JMPR. Given that fluensulfone was found at higher levels than TSA in animal matrices, while BSA was not detected, parent compound is the most suitable marker residue for animal commodities. The Meeting concluded that the residue definition for enforcement in animal commodities should be fluensulfone.

Finite residues of fluensulfone parent compound were found in poultry fat (0.009–0.041 mg/kg), while fluensulfone parent residues in muscle were ≤ 0.001 mg/kg. As residues of parent in fat were at least 9 × those in muscle, the Meeting concluded that fluensulfone residues are fat soluble.

Noting that only parent compound is of toxicological relevance, the Meeting concluded that the residue definition for dietary risk assessment in animal commodities should be fluensulfone.

The 2014 JMPR determined that the metabolite MeS was not covered by the toxicological endpoints for parent compound and should be assessed using the Threshold of Toxicological Concern (TTC) approach. The 2014 JMPR determined that the IEDI and the IESTIs for the metabolite MeS should be compared to the Cramer class III TTC value of 1.5 µg/kg bw/day and the single-exposure TTC value for Cramer class III compounds of 5 µg/kg bw respectively.

The Meeting considered that this approach should be re-evaluated based on available data and all proposed GAPs. The WHO panel at the current Meeting noted that no new information was available regarding MeS and that the TTC approach for this metabolite remained appropriate. The Meeting noted that no additional residue data for MeS were available and further noted that the metabolism studies in potatoes, tomatoes and lettuce did not identify MeS. The MeS residue data for cucumber, summer squash, melons, tomatoes, and sweet and chilli peppers first provided to the 2014 JMPR was considered against the new GAPs for fruiting vegetables, cucurbits, and fruiting vegetables other than cucurbits. The calculated IEDI was 4% of the Cramer class III TTC value. The maximum IESTI was 60% of the single-exposure Cramer class III TTC value. The Meeting concluded that MeS was not a relevant metabolite for the crops considered.

Definition of the residue (for compliance with MRLs) for plant commodities: *sum of fluensulfone and 3,4,4-trifluorobut-3-ene-1-sulfonic acid (BSA), expressed as fluensulfone equivalents.*

Definition of the residue (for dietary risk assessment) for plant commodities: *fluensulfone*

Definition of the residue (for compliance with MRLs and for dietary risk assessment) for animal commodities: *fluensulfone*

The residue is fat soluble.

Results of supervised residue trials on crops

The Meeting received supervised trial data for pre-planting soil application of fluensulfone to strawberries, cabbage, cauliflower, head lettuce, leafy lettuce, spinach, mustard greens, komatsuna (Japanese mustard spinach), mizuna (hot herb mustard), carrots, potatoes, radish (including radish leaves), daikon (Japanese radish), and turnips (including turnip leaves). US GAP information was provided for all crops for which residue data was submitted.

Residue trial data in cucumber, summer squash, melons, chilli peppers, sweet peppers (capsicum), and tomatoes previously considered by the 2014 JMPR were resubmitted, with an amended US GAP.

For the residue trials, residues of parent and the metabolites TSA, BSA, and (where reported), MeS are tabulated as residues of the individual compound.

For enforcement, the residue definition is the sum of fluensulfone and BSA, expressed as fluensulfone.

Residues of fluensulfone according to the enforcement definition are calculated by summing the fluensulfone residues plus the BSA residues multiplied by a factor of 1.53 based on the molecular weights of fluensulfone (291.7) and BSA (190.1).

The method LOQ was 0.01 mg/kg for each analyte, or 0.01, 0.015, and 0.015 mg/kg as parent equivalents for parent compound, TSA and BSA respectively.

Where a residue below the LOQ was detected, the value is reported in parentheses after the < LOQ. Where residues were undetected, a value of zero was used for the summation to give total residues. Where a detectable residue < LOQ was reported, a value of the LOQ (0.01 mg/kg) was used for the summation.

For dietary risk assessment, only fluensulfone parent compound is included in the definition.

In the sections below for each individual crop, residues of parent plus BSA as parent equivalents are reported as ‘residues addressing the definition for enforcement’. Residues of fluensulfone only for dietary risk assessment are reported as ‘residues addressing the definition for dietary risk assessment’.

Berries and other small fruits

The GAP in the USA for the low-growing berry subgroup (US Crop Group 13-07G, including bearberry, bilberry, lowbush blueberry, cloudberry, cranberry, lingonberry, muntries, partridgeberry, strawberry cultivars, and varieties or hybrids of the above) is a single 3.9 kg ai/ha soil application of an EC formulation made by broadcast, banded or drip irrigation application 7 days before transplanting.

Strawberry

Residue trials in strawberry in accordance with the US GAP were conducted in the USA.

Residues addressing the definition for enforcement at harvest were < 0.015 (3), 0.023, 0.025, 0.077, 0.14, and 0.26 mg/kg.

Residues addressing the definition for dietary risk assessment at harvest were < 0.01 (8) mg/kg.

The Meeting noted that the berries covered by the US GAP included all members of the Codex low growing berries subgroup and that strawberries are a representative crop for the subgroup. The Meeting agreed to extrapolate the recommendations for strawberry to low-growing berries.

The Meeting estimated a maximum residue level of 0.5 mg/kg for fluensulfone in low-growing berries, together with an STMR of 0.01 mg/kg, and an HR of 0.01 mg/kg.

Brassica (cole or cabbage) vegetables, Head cabbages, Flowerhead brassicas

The US GAP for Brassica (cole) leafy vegetables (US Crop Group 5, which covers the Codex Brassica vegetable group) is a single 3.9 kg ai/ha soil broadcast, band or drip irrigation application of an EC formulation made 30 days before sowing or transplanting.

Residue trials in accordance with the US GAP were conducted in the USA for cabbage, head and cauliflower.

Residues addressing the definition for enforcement in head cabbage at harvest were 0.040, 0.055, 0.12, 0.18, 0.23, and 1.1 mg/kg.

Residues addressing the definition for dietary risk assessment in head cabbage at harvest were < 0.01 (6) mg/kg.

Residues addressing the definition for enforcement in cauliflower at harvest were < 0.015, 0.060, 0.091, 0.12, and 0.26 mg/kg.

Residues addressing the definition for dietary risk assessment in cauliflower at harvest were < 0.01 (5) mg/kg.

The Meeting noted that the US GAP applied to the Brassica vegetable group, and that the GAP was for pre-plant soil application rather than foliar application so plant form was less likely to have an impact on residues. The Meeting considered a group maximum residue level for Brassica vegetables. Noting that the median residues for cabbage and cauliflower differed by a factor of < 5 (1.2 ×), and considering that the datasets were similar (Mann-Whitney test), the Meeting agreed to combine the residue datasets for cabbage and cauliflower for estimation of a group maximum residue level.

Combined dataset addressing the definition for enforcement: < 0.015, 0.040, 0.055, 0.060, 0.091, 0.12 (2), 0.18, 0.23, 0.26, and 1.1 mg/kg.

Combined dataset addressing the definition for dietary risk assessment: < 0.01 (11) mg/kg.

The Meeting estimated a maximum residue level of 1.5 mg/kg for fluensulfone in Brassica (cole or cabbage) vegetables, Head cabbages, Flowerhead brassicas, together with an STMR of 0.01 mg/kg and an HR of 0.01 mg/kg.

Fruiting vegetables, Cucurbits

Residue data in cucurbit fruiting vegetables (cucumber, summer squash and melons) was considered by the 2014 JMPR. and maximum residue levels were estimated based on a US GAP of a single broadcast, band or drip irrigation application at 2.8 kg ai/ha 7 days before transplanting or 14 days before direct seeding, using data proportionally adjusted for application rate.

The new US GAP for cucurbit vegetables Crop Group 9, corresponding to the Codex classification fruiting vegetables, cucurbits, is a single soil application by broadcast, band or drip irrigation application of an EC formulation at 3.9 kg ai/ha 7 days before transplanting or 14 days before direct seeding.

Residue data from trials conducted in the USA and Canada in cucumber, summer squash, and melons considered by the 2014 JMPR were considered against the new GAP.

A number of trials were conducted with a shorter interval between application and planting than specified on the label (3 days rather than 7 days). However, the Meeting considered that this difference of 4 days was insignificant when compared to the total expected time between application/planting and harvest and would not have a significant effect on residues.

In trials matching GAP, residues addressing the definition for enforcement in cucumber at harvest were < 0.015 (2), 0.015 (2), 0.025, 0.092, 0.097, 0.11, 0.25, and 0.34 mg/kg (highest individual result 0.54 mg/kg).

Residues addressing the definition for dietary risk assessment in cucumber at harvest were < 0.01 (10) mg/kg.

After treatment in accordance with GAP, residues addressing the definition for enforcement in summer squash at harvest were < 0.025, 0.091, 0.10, 0.14, 0.30, 0.32, 0.33, and 0.39 mg/kg.

Residues addressing the definition for dietary risk assessment in summer squash at harvest were < 0.01 (7), and 0.014 mg/kg (highest individual result 0.017 mg/kg).

After treatment in accordance with GAP, residues addressing the definition for enforcement in melons at harvest were < 0.015 (3), 0.015, 0.038, 0.049, 0.075, 0.098, and 0.17 mg/kg (highest individual result 0.18 mg/kg).

Residues addressing the definition for risk assessment in melons were: < 0.01 (9) mg/kg.

The Meeting noted that the US GAP is for the cucurbit fruiting vegetables group and considered a group maximum residue level. However, the median residues for summer squash differed from that for melons by more than a factor of 5 × (5.8 ×). Therefore, a maximum residue level for the whole group is not appropriate.

The Meeting estimated a maximum residue level of 0.3 mg/kg for melons (except watermelons), together with an STMR of 0.01 mg/kg and an HR of 0.01 mg/kg. The Meeting agreed to extrapolate these estimations to watermelons.

The Meeting noted that the median residues for summer squash and for cucumbers differed by less than a factor of 5 × (3.8 ×), and further that the data sets were similar (Mann-Whitney). The Meeting agreed to combine the cucumber and summer squash data sets for mutual support for determination of appropriate maximum residue levels.

Residues addressing the definition for enforcement at harvest: < 0.015, < 0.015, 0.015 (2), < 0.025, 0.025, 0.091, 0.092, 0.097, 0.10, 0.11, 0.14, 0.25, 0.30, 0.32, 0.33, 0.34, and 0.39 mg/kg (highest individual result 0.54 mg/kg).

Residues addressing the definition for dietary risk assessment at harvest: < 0.01 (17), and 0.014 mg/kg (highest individual result 0.017 mg/kg).

The Meeting estimated maximum residue levels of 0.7 mg/kg for cucumber and summer squash, together with STMRs of 0.01 mg/kg, and HRs of 0.017 mg/kg (highest individual analytical result).

The Meeting withdrew the previous maximum residue level recommendation of 0.3 mg/kg for fruiting vegetables, cucurbits.

Fruiting vegetables, other than Cucurbits

Residue data in fruiting vegetables other than cucurbits (tomato, sweet pepper (capsicum), and chilli pepper) was considered by the 2014 JMPR. Maximum residue levels were estimated based on a US GAP of a single broadcast, band or drip irrigation application at 2.8 kg ai/ha, 7 days before transplanting or 14 days before direct seeding, using data proportionally adjusted for application rate.

The new US GAP for fruiting vegetables crop group 8–10, corresponding to the Codex group of fruiting vegetables, other than cucurbits, except sweet corn and mushroom, is a single soil application by broadcast, band or drip irrigation application of an EC formulation at 3.9 kg ai/ha, 7 days before transplanting or 14 days before direct seeding.

Residue data in tomato, sweet peppers (capsicum), and chili peppers considered by the 2014 JMPR were considered against the new GAP.

A number of trials were conducted with a shorter interval between application and planting than specified on the label (3 days rather than 7 days). However, the Meeting considered that this difference of 4 days was insignificant when compared to the total expected time between application/planting and harvest and would not have a significant effect on residues.

In trials matching GAP, residues addressing the definition for enforcement in tomatoes at harvest were < 0.015 (4), 0.019, 0.026, 0.035, 0.039, 0.052, 0.068, 0.11, 0.13, 0.14, 0.26, 0.30, 0.35, and 0.41 (2) mg/kg.

Residues addressing the definition for dietary risk assessment in tomatoes at harvest were < 0.01 (18) mg/kg.

After treatment in accordance with GAP, residues addressing the definition for enforcement in peppers at harvest were < 0.015 (2), 0.032, 0.061, 0.063, 0.074, 0.084, 0.096, 0.11 (2), 0.13, 0.21, 0.28, and 0.36 mg/kg.

Residues addressing the definition for dietary risk assessment in peppers at harvest were < 0.01 (14) mg/kg.

The Meeting noted that the GAP applied to fruiting vegetables other than cucurbits, except sweetcorn and mushrooms, and considered a group maximum residue level. The Meeting further noted that the median residues differed by less than a factor of 5 × (2.0×), that the data sets were similar (Mann-Whitney), and agreed to combine the datasets:

Residues addressing the definition for enforcement at harvest: < 0.015 (6), 0.019, 0.026, 0.032, 0.035, 0.039, 0.052, 0.061, 0.063, 0.068, 0.074, 0.084, 0.096, 0.11 (3), 0.13 (2), 0.14, 0.21, 0.26, 0.28, 0.31, 0.35, 0.36, and 0.41 (2) mg/kg (highest individual result 0.42 mg/kg).

Residues addressing the definition for risk assessment at harvest: < 0.01 (32) mg/kg.

The Meeting estimated a maximum residue level of 0.7 mg/kg for fruiting vegetables, other than cucurbits (except sweet corn and mushrooms), together with an STMR of 0.01 mg/kg and an HR of 0.01 mg/kg.

The Meeting withdrew the previous maximum residue level recommendation of 0.3 mg/kg for fruiting vegetables other than cucurbits (except sweetcorn and mushrooms).

Based on the estimated group maximum residue level and applying a processing factor of 10×, the Meeting estimated a maximum residue level of 7 mg/kg for Peppers, Chili, dried, together with an STMR of 0.10 and an HR of 0.10 mg/kg.

The Meeting withdrew the previous maximum residue level recommendation of 2 mg/kg for peppers, chilli, dried.

Leafy vegetables (except Brassica leafy vegetables)

The US GAP for leafy vegetables (Crop Group 4) is a single soil broadcast, band or drip irrigation application of an EC formulation at 3.9 kg ai/ha a minimum of 7 days before transplanting or a minimum of 14 days before direct seeding.

Residue trials matching the US GAP were conducted in the USA for lettuce, head, lettuce, leaf, and spinach.

Residues addressing the definition for enforcement in head lettuce at harvest were < 0.015 (3), 0.025, 0.066, and 0.41 mg/kg (highest individual result 0.43 mg/kg).

Residues addressing the definition for dietary risk assessment in head lettuce were: < 0.01 (5), and 0.017 mg/kg (highest individual result 0.018 mg/kg).

Residues addressing the definition for enforcement in leaf lettuce at harvest were 0.018, 0.044, 0.13, and 1.4 mg/kg (highest individual result 1.5 mg/kg).

Residues addressing the definition for dietary risk assessment in leaf lettuce were < 0.01 (2), 0.013, and 0.030 mg/kg (highest individual result 0.035 mg/kg).

Residues addressing the definition for enforcement in Cos lettuce at harvest were 0.048 and 0.36 mg/kg (highest individual result 0.36 mg/kg).

Residues addressing the definition for dietary risk assessment in Cos lettuce were 0.017 and 0.059 mg/kg (highest individual result 0.060 mg/kg).

Residues addressing the definition for enforcement in spinach at harvest were < 0.015, 0.21, 0.49, 0.58, 0.78, and 1.8 mg/kg (highest individual result 1.8 mg/kg).

Residues addressing the definition for dietary risk assessment in spinach were < 0.01 (6) mg/kg.

The Meeting estimated a maximum residue level of 0.8 mg/kg for lettuce, head, together with an STMR of 0.01 mg/kg, and an HR of 0.018 mg/kg (highest individual result).

The Meeting considered that there were insufficient trials to estimate maximum residue levels for leaf lettuce or Cos lettuce.

The Meeting estimated a maximum residue level of 4 mg/kg for spinach, together with an STMR of 0.01 mg/kg, and an HR of 0.01 mg/kg.

Radish leaves (including Radish tops)

The US GAP for the root vegetables subgroup 1B (including radish) is a single soil application of a granular formulation at 4.0 kg ai/ha 10 days before sowing.

Residue data for radish leaves from trials conducted in the USA in accordance with GAP are available.

Residues of for enforcement in radish leaves at harvest were 1.5, 1.7, 6.9, and 21 mg/kg (highest individual result 23 mg/kg).

Residues addressing the definition for dietary risk assessment in radish leaves were < 0.01 (4) mg/kg.

The Meeting estimated a maximum residue level of 50 mg/kg for Radish leaves (including Radish tops), together with an STMR of 0.01 mg/kg, and an HR of 0.01 mg/kg.

Brassica leafy vegetables

The US GAP for Brassica (cole) leafy vegetables (Crop Group 5), covering the Codex Brassica leafy vegetables subgroup is a single broadcast, band or drip irrigation soil application of an EC formulation at 3.9 kg ai/ha a minimum of 30 days before transplanting.

Residue trials in accordance with the US Brassica leafy vegetables GAP were conducted in the USA for mustard greens, komatsuna, and mizuna. Residue trials were conducted in turnips, using a GAP that matches the Brassica leafy vegetables GAP, and data for turnip leaves are available.

Residues addressing the definition for enforcement in komatsuna at harvest were 0.54, 0.59, 0.61, and 4.0 mg/kg (highest individual result 5.5 mg/kg).

Residues addressing the definition for dietary risk assessment in komatsuna were < 0.01 (4) mg/kg.

Residues addressing the definition for enforcement in mizuna at harvest were 0.77, 0.83, 1.3, and 8.0 mg/kg (highest individual result 9.1 mg/kg).

Residues addressing the definition for dietary risk assessment in mizuna were < 0.01 (4) mg/kg.

Residues addressing the definition for enforcement in mustard greens at harvest were 0.11, 0.16, 4.6, 6.1, and 6.5 mg/kg (highest individual result 7.5 mg/kg).

Residues addressing the definition for risk assessment in mustard greens were < 0.01 (5) mg/kg.

Residues addressing the definition for enforcement in turnip greens at harvest were 0.036, 0.53, 1.4, and 4.8 mg/kg (highest individual result 5.1 mg/kg).

Residues addressing the definition for risk assessment in turnip greens were < 0.01 (4) mg/kg.

The Meeting noted that the GAP was for Brassica leafy vegetables and considered a maximum residue level for the subgroup. However, the median residue for mustard greens differs from that for komatsuna by more than a factor of 5 × (7.7 ×). Therefore, the Meeting considered that a group maximum residue level was not appropriate and individual commodity limits were estimated.

The Meeting estimated a maximum residue level of 9 mg/kg for komatsuna, together with an STMR of 0.01 mg/kg, and an HR of 0.01 mg/kg.

The Meeting estimated a maximum residue level of 20 mg/kg for mustard greens, together with an STMR of 0.01 mg/kg, and an HR of 0.01 mg/kg.

The Meeting estimated a maximum residue level of 10 mg/kg for turnip greens, together with an STMR of 0.01 mg/kg, and an HR of 0.01 mg/kg.

The Meeting noted that no Codex classification was available for mizuna, and therefore a maximum residue level could not be estimated.

Root and tuber vegetables

The US GAP for the root vegetables subgroup 1B (except sugar beet), including carrot, radish, turnip, garden beet, edible burdock, celeriac, turnip-rooted chervil, chicory, ginseng, horseradish, turnip-rooted parsley, parsnip, oriental radish, rutabaga (swede), salsify, black salsify, Spanish salsify, and skirret is a single broadcast or banded soil incorporation application of a granular formulation at 4.0 kg ai/ha applied 10 days before planting.

The US GAP for the tuberous and corm vegetables subgroup 1C, including potato, sweet potato, yam, arracacia, arrowroot, Chinese artichoke, Jerusalem artichoke, edible canna, cassava (bitter and sweet varieties), chayote root, chufa, taro (dasheen), ginger, lerén, tanier, turmeric, yam bean and true yams is a single broadcast or banded soil incorporation application of a granular formulation at 4.0 kg ai/ha, with application permissible pre-planting or at planting.

Carrot and radish

Residue trials in accordance with the US GAP were conducted for carrots and radish in the USA and Canada.

Residues addressing the definition for enforcement in carrot at harvest were < 0.015, 0.091, 0.29, 0.33, 0.56, 0.58, 0.68, 0.79, 0.80, 1.5, and 2.2 mg/kg (highest individual result 2.3 mg/kg).

Residues addressing the definition for dietary risk assessment in carrot were < 0.01 (2), 0.050, 0.058, 0.10, 0.12, 0.17, 0.20, 0.26, 0.47, and 0.49 mg/kg (highest individual result 0.50 mg/kg).

Residues addressing the definition for enforcement in radish at harvest were 0.12, 0.28, 0.35, and 2.8 mg/kg (highest individual result 3.4 mg/kg).

Residues addressing the definition for dietary risk assessment in radish were < 0.01 (4) mg/kg.

The Meeting noted that the median residues for carrots and radish differed by less than a factor of 5 × (1.8 ×), and that the data sets were statistically similar (Mann-Whitney), and agreed to combine the results for mutual support:

Residues in carrots and radish in accordance with the definition for enforcement: < 0.015, 0.091, 0.12, 0.28, 0.29, 0.33, 0.35, 0.56, 0.58, 0.68, 0.79, 0.80, 1.5, 2.2, and 2.8 mg/kg (highest individual result 3.4 mg/kg).

The Meeting estimated maximum residue levels of 4 mg/kg for fluensulfone in carrot and radish. The Meeting estimated an STMR of 0.12 mg/kg and an HR of 0.50 mg/kg (highest individual result) for carrot and radish, based on the carrot dataset.

The Meeting noted that the GAP for the root vegetables subgroup 1B represented the critical GAP for a number of other root vegetables, and agreed to extrapolate the estimations for carrots and radish to beetroot, celeriac, horseradish, Japanese radish, parsnips, swede (rutabaga), turnip rooted chervil, and turnip.

The Meeting estimated maximum residue levels of 4 mg/kg for fluensulfone in beetroot, celeriac, horseradish, Japanese radish, parsnip, swede, turnip-rooted chervil, and turnip, together with STMRs of 0.12 mg/kg and HRs of 0.50 mg/kg.

Potato

Residue trials in accordance with the US GAP for tuberous and corm vegetables (subgroup 1C) were conducted for potatoes in the USA and Canada.

Residues addressing the definition for enforcement in potatoes at harvest were 0.084, 0.087, 0.10, 0.11, 0.12, 0.13, 0.15 (3), 0.17 (2), 0.19, 0.20, 0.28, 0.30, 0.41, 0.48, and 0.51 mg/kg (highest individual result 0.64 mg/kg).

Residues addressing the definition for dietary risk assessment in potatoes were < 0.01 (18) mg/kg.

The Meeting estimated a maximum residue level of 0.8 mg/kg for fluensulfone in potato, together with an STMR of 0.01 mg/kg, and an HR of 0.01 mg/kg.

Noting that the US GAP covered the US crop group tuberous and corm vegetables, the Meeting agreed that the maximum residue level, STMR and HR estimations above could be extrapolated to sweet potato.

Celery

The US GAP for celery and rhubarb is a single soil application (broadcast, band or drip irrigation) of an EC formulation at 3.9 kg ai/ha applied 7 days before transplanting.

Residue trials were conducted in the USA for celery in accordance with GAP.

Residues addressing the definition for enforcement in celery at harvest were < 0.015, 0.12, 0.36, 0.63, 0.78, and 1.0 mg/kg (highest individual result).

Residues addressing the definition for dietary risk assessment in celery were < 0.01, 0.028, 0.087, 0.13, 0.36, and 0.52 mg/kg (highest individual result 0.55 mg/kg).

The Meeting estimated a maximum residue level of 2 mg/kg for fluensulfone in celery, together with an STMR of 0.1085 mg/kg, and an HR of 0.55 mg/kg (highest individual residue result).

The Meeting noted that the US GAP for rhubarb was the same as that for celery but considered that extrapolation of the estimations from a temporary crop (celery) to a semi-permanent perennial crop (rhubarb) was not appropriate for a pre-planting soil application.

Rotational crops

A field rotational cropping study conducted in the USA was presented to the Meeting. A single application of fluensulfone was made to bare soil at 4.0 kg ai/ha, with following crops (wheat, radish, lettuce and beans) planted at intervals of 28, 60, 120, 180, 270 and 365 days after application.

Instructions on US fluensulfone labels provided to the Meeting regarding following crops are that no more than 4.0 kg ai/ha is to be applied to a plot in one year. Immediate plant-back of crops for which a registered GAP exists (i.e. strawberries, Brassica vegetables, cucurbits, fruiting vegetables other than cucurbits (except sweetcorn and mushrooms), leafy vegetables, root and tuber vegetables,

celery and rhubarb) is permitted. A plant back interval of one year is mandated for crops for which there is no registered use, with no planting of cereals permitted after a fluensulfone application.

Radish and lettuce have GAPs for direct application. At the shortest planting interval, 28 days (or a later interval if a higher residue was observed at the site), the following residues of fluensulfone at harvest were observed: radish roots (in accordance with the definition for enforcement), 0.08 and 1.4 mg/kg; radish roots (in accordance with the definition for dietary risk assessment), < 0.01 (2) mg/kg; radish leaves (in accordance with the definition for enforcement), 0.63 and 6.1 mg/kg; radish leaves (in accordance with the definition for dietary risk assessment), < 0.01 (2) mg/kg; lettuce (in accordance with the definition for enforcement), < 0.015 and 0.52 mg/kg; and lettuce (in accordance with the definition for dietary risk assessment), < 0.01 (2) mg/kg.

The Meeting noted the label instruction that no more than 4.0 kg ai/ha of fluensulfone are to be applied to a plot in one year, which precludes a second application to a crop planted back within one year of a failed treated crop. The Meeting considered that rotational residues of fluensulfone in radish roots, radish leaves, and lettuce would be covered by the maximum residue levels estimated by the Meeting (5, 50, and 0.8 mg/kg respectively). The Meeting further considered that this reasoning could be extrapolated to other root and leafy crops.

Based on the radish root data, the Meeting estimated a maximum residue level of 3 mg/kg for root and tuber vegetables (not specified elsewhere), together with an STMR and an HR of 0.01 mg/kg.

Based on the lettuce data, the Meeting estimated a maximum residue level of 1 mg/kg for leafy vegetables (not specified elsewhere), together with an STMR and an HR of 0.01 mg/kg.

Noting that a further application could be made for a following crop one year after an application to a previous crop, the following residues addressing the enforcement definition were observed in radish and lettuce after a 365-day plant back interval: radish roots, < 0.015 (2) mg/kg; radish leaves, < 0.015 and < 0.025 mg/kg; and lettuce, < 0.015 (2) mg/kg.

Finite residues of fluensulfone were not observed in radish roots or leaves, or in lettuce when these crops were planted one year after a fluensulfone at GAP. The Meeting therefore considered that no carry-over of residues into following crops of root or leafy vegetables planted one year later would occur, and no adjustment of maximum residue level estimations to account for residues from previous applications was required.

At the 365-day planting interval, the following residues of fluensulfone were observed for wheat and bean crops: wheat grain (in accordance with the definition for enforcement), < 0.015 (2) mg/kg; wheat grain (in accordance with the definition for dietary risk assessment), < 0.01 (2) mg/kg; beans with pods (in accordance with the definition for enforcement), < 0.015 and 0.054 (270-day PBI, 365-day PBI crop failed) mg/kg; and beans with pods (in accordance with the definition for dietary risk assessment): < 0.01 (2) mg/kg.

As residues were not detected in wheat grain, and further, the label carries an instruction not to plant cereals following a fluensulfone application, the Meeting considered that it is not necessary to estimate maximum residue levels for cereal grains or feed items planted in rotation with crops treated with fluensulfone.

Based on the beans with pods data, the Meeting estimated a maximum residue level of 0.1 mg/kg for legume vegetables, together with an STMR of 0.01 mg/kg, and an HR of 0.01 mg/kg, to cover residues arising in following crops.

Fate of residues during processing

Tomato

A processing study in tomatoes was considered by the 2014 JMPR. The processing factors determined for the metabolite BSA from that study are tabulated below. Residues of parent compound were < 0.01 mg/kg in all samples, and processing factors could not therefore be determined.

Processing factors for the BSA metabolite of fluensulfone in tomatoes

Tomato commodity	Average (best estimate) BSA processing factor	STMR-P mg/kg [a]	HR-P mg/kg [a]
Canned	0.33	0.01	0.01
Dry pomace	11	0.01	–
Peeled	0.33	0.01	0.01
Dried	1.8	0.01	0.01
Juice	0.75	0.01	–
Paste	1.8	0.01	–
Puree	1.0	0.01	–
Wet pomace	2.6	0.01	–

[a] Fluensulfone only, in accordance with the dietary risk assessment definition. Residues of parent compound were < 0.01 mg/kg in all raw commodity and processed tomato samples.

Based on the maximum residue level of 0.7 mg/kg estimated for fruiting vegetables, other than cucurbits, except sweet corn and mushrooms, and the processing factors of 1.8 for both dried tomatoes and tomato paste, the Meeting estimated maximum residue levels of 1.5 mg/kg for both dried tomatoes and tomato paste, together with STMR-Ps of 0.01 mg/kg and HR-Ps of 0.01 mg/kg.

The Meeting withdrew the recommendations of the 2014 JMPR for maximum residue levels of 0.5 mg/kg in dried tomatoes and tomato paste.

Potato

A processing study for potato was provided to the Meeting. The Meeting received data illustrating the concentration or diminution of residues during processing of potatoes into potato chips, and dried potato flakes, including wet peel as a by-product.

Processing factors for BSA in potatoes

Potato commodity	BSA processing factors	STMR-P mg/kg [a]
Dried potato flakes	2.4	0.01
Wet peel	0.3	0.01
Potato chips (crisps)	1.6	0.01

[a] Fluensulfone only, in accordance with the dietary risk assessment definition. Residues of parent compound were < 0.01 mg/kg in all raw commodity and processed potato samples.

The Meeting estimated a maximum residue level of 2 mg/kg for potato, dried based on the raw commodity maximum residue level estimate of 0.8 mg/kg for potato, and the processing factor (2.4), together with an STMR-P of 0.01 mg/kg, and an HR-P of 0.01 mg/kg.

Residues in animal commodities

Farm animal feeding studies

Farm animal feeding studies were not available.

Livestock dietary burden

Dietary burden calculations for cattle and poultry are provided below. The dietary burdens were estimated using the OECD diets listed in Appendix IX of the 2016 edition of the FAO Manual.

Summary of livestock dietary burden (ppm in diet on a dry weight basis)

	USA-Canada		EU		Australia		Japan	
	Max	Mean	Max	Mean	Max	Mean	Max	Mean
Beef cattle	0.04	0.04	2.05 [A]	0.53 [B]	0.53	0.15	0	0
Dairy cattle	0.44	0.12	1.04 [C]	0.28 [D]	0.50	0.12	0	0
Broiler hens	0	0	0.51	0.13	0	0	0	0

	USA-Canada		EU		Australia		Japan	
	Max	Mean	Max	Mean	Max	Mean	Max	Mean
Laying hens	0	0	0.51 [E]	0.13 [F]	0	0	0	0

[A] Highest maximum dietary burden for beef cattle suitable for estimation of MRLs for mammalian meat and offal

[B] Highest mean dietary burden for beef cattle suitable for estimation of STMRs for mammalian meat and offal.

[C] Highest maximum dietary burden for dairy cattle suitable for estimation of MRLs for milk.

[D] Highest mean dietary burden for dairy cattle suitable for estimation of STMRs for milk.

[E] Highest maximum dietary burden for broiler and layer poultry suitable for estimation of MRLs for poultry meat, offal and eggs.

[F] Highest mean dietary burden for broiler and layer poultry suitable for estimation of STMRs for poultry meat, offal and eggs.

Animal commodity maximum residue levels

Cattle feeding studies are not available. In a lactating goat metabolism study considered by the 2014 JMPR, animals were dosed at 10 ppm. No residues of any compounds specific to fluensulfone were detected in goat milk or tissues. The highest maximum dietary burdens in beef cattle and dairy cattle are 2.1 and 1.0 ppm respectively. The metabolism study dose exceeds the maximum dietary burden by a factor of approximately 5×. The Meeting concluded that maximum residue levels for mammalian commodities should be estimated at the LOQ, with dietary parameters at 0. An analytical method for fluensulfone parent compound in animal commodities is available, with a validated LOQ of 0.01 mg/kg.

The Meeting estimated maximum residue levels of 0.01* mg/kg for edible offal (mammalian), mammalian fats, milks, and meat (from mammals other than marine mammals).

The Meeting estimated STMR and HR values of 0 mg/kg for edible offal (mammalian), mammalian fats, and meat (from mammals other than marine mammals).

A poultry feeding study is not available. In a laying hen metabolism study considered by the 2014 JMPR, birds were dosed at 9.8 ppm in feed. Residues of fluensulfone parent compound were observed at up to 0.041 mg/kg were observed in poultry fat. Residues of parent fluensulfone were not quantified in any other poultry matrices (eggs, offal or muscle). The highest maximum dietary burden for broiler and layer poultry is 0.51 ppm. The metabolism study dose exceeds the maximum dietary burden by a factor of 19. The Meeting concluded that maximum residue levels for eggs, poultry meat and poultry offal should be estimated at the LOQ, with dietary parameters at 0.

The Meeting estimated maximum residue levels of 0.01* mg/kg for eggs, poultry meat, and poultry, edible offal of.

The Meeting estimated STMR and HR values of 0 mg/kg for eggs, poultry meat, and poultry, edible offal of.

Scaling poultry fat residues from the metabolism study for the maximum feeding level, the expected highest residue in poultry fat is 0.0021 mg/kg (= 0.041 × 0.51/9.8). Scaling poultry fat residues from the metabolism study for the mean feeding level, the expected median residue in poultry fat is 0.0005 mg/kg (= 0.041 × 0.13/9.8).

The Meeting estimated maximum residue levels of 0.01 mg/kg for poultry fats. The Meeting estimated STMR and HR values of 0.0005 and 0.0021 mg/kg for poultry fats.

RECOMMENDATIONS

On the basis of the data obtained from supervised residue trials the Meeting concluded that the residue levels listed below are suitable for establishing maximum residue limits and for IEDI and IESTI assessments.

The Meeting withdrew the previous recommendation for the residue definition for enforcement and dietary risk assessment in plant commodities: *3,4,4-trifluorobut-3-ene-1-sulfonic acid (BSA).*

Definition of the residue (for compliance with MRLs) for plant commodities: *sum of fluensulfone and 3,4,4-trifluorobut-3-ene-1-sulfonic acid (BSA), expressed as fluensulfone equivalents.*

Definition of the residue (for dietary risk assessment) for plant commodities: *fluensulfone*

Definition of the residue (for compliance with MRLs and for dietary risk assessment) for animal commodities: *fluensulfone*

The residue is fat soluble.

CCN	Commodity name	Recommended maximum residue level, mg/kg		STMR (P), mg/kg	HR (P), mg/kg
		New	Previous		
VR 0574	Beetroot	4		0.12	0.50
VB 0400	Brassica (cole or cabbage) vegetables, Head cabbage, Flowerhead brassicas	1.5		0.01	0.01
VR 0577	Carrot	4		0.12	0.50
VR 0578	Celeriac	4		0.12	0.50
VS 0624	Celery	2		0.1085	0.55
VR 0579	Chervil, Turnip-rooted	4		0.12	0.50
VC 0424	Cucumber	0.7		0.01	0.017
MO 0105	Edible offal (mammalian)	0.01*		0	0
PE 0112	Eggs	0.01*		0	0
VC 0045	Fruiting vegetables, Cucurbits	W	0.3		
VO 0050	Fruiting vegetables, other than Cucurbits, except sweetcorn and mushroom	0.7	0.3	0.01	0.01
VR 0583	Horseradish	4		0.12	0.50
VL 0481	Komatsuma	9		0.01	0.01
VL 0053	Leafy vegetables (not specified elsewhere)	1 (R)		0.01	0.01
VP 0060	Legume vegetables	0.1 (R)		0.01	0.01
VL 0482	Lettuce, Head	0.8		0.01	0.018
FB 2009	Low-growing berries	0.5		0.01	0.01
MF 0100	Mammalian fats (except milk fats)	0.01*		0	0
MM 0095	Meat (from mammals other than marine mammals)	0.01* (fat)		0	0
VC 0046	Melons, except watermelon	0.3		0.01	0.01
ML 0106	Milks	0.01*		0	
VL 0485	Mustard greens	20		0.01	0.01
VR 0588	Parsnip	4		0.12	0.50
HS 0444	Peppers, chilli, dried	7	2	0.10	0.10
VR 0589	Potato	0.8		0.01	0.01
DV 0589	Potato, dried	2		0.01	
PO 0111	Poultry, Edible offal of	0.01*		0	0
PF 0111	Poultry fats	0.01		0.0005	0.0021
PM 0110	Poultry meat	0.01*		0 0.005 (fat)	0 0.0021 (fat)
VR 0494	Radish	4		0.12	0.50
VR 0591	Radish, Japanese	4		0.12	0.50
VL 0494	Radish leaves	50		0.01	0.01
VR 0075	Root and tuber vegetables (not specified elsewhere)	3 (R)		0.01	0.01
VL 0502	Spinach	4		0.01	0.01
VC 0431	Squash, summer	0.7		0.01	0.017

CCN	Commodity name	Recommended maximum residue level, mg/kg		STMR (P), mg/kg	HR (P), mg/kg
		New	Previous		
VR 0497	Swede	4		0.12	0.50
VR 0508	Sweet potato	0.8		0.01	0.01
DV 0448	Tomato, dried	1.5	0.5	0.01	0.01
VW 0448	Tomato paste	1.5	0.5	0.01	
VR 0506	Turnip, Garden	4		0.12	0.50
VL 0506	Turnip greens	10		0.01	0.01
VC 0432	Watermelon	0.3		0.01	0.01

(R) Indicates a maximum residue level relating to rotational crops.

DIETARY INTAKE ASSESSMENT

Long-term dietary exposure

The International Estimated Daily Intakes (IEDIs) of fluensulfone were calculated for the 17 GEMS/Food cluster diets using STMRs/STMR-Ps estimated by the current Meeting. The results are shown in Annex 3 of the 2016 Report.

The ADI for fluensulfone is 0–0.01 mg/kg bw. The calculated IEDIs for fluensulfone were 1–3% of the maximum fluensulfone ADI. The Meeting concluded, on the basis of the information provided to the Meeting, that the long-term exposure to residues of fluensulfone are unlikely to present a public health concern.

Short-term dietary exposure

The International Estimated Short Term Intakes (IESTIs) of fluensulfone were calculated for food commodities using HRs/HR-Ps or STMRs/STMR-Ps estimated by the current Meeting. The results are shown in Annex 4 to the 2016 Report.

The ARfD for fluensulfone is 0.3 mg/kg bw.

The calculated maximum IESTI for fluensulfone was 9% of the ARfD for children and 5% for the general population. The Meeting concluded that the short-term dietary exposure to residues of fluensulfone, when used in accordance with GAPs that have been considered by JMPR, are unlikely to present a public health concern.

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